

THE OX
AND ITS KINDRED
R. LYDEKKER



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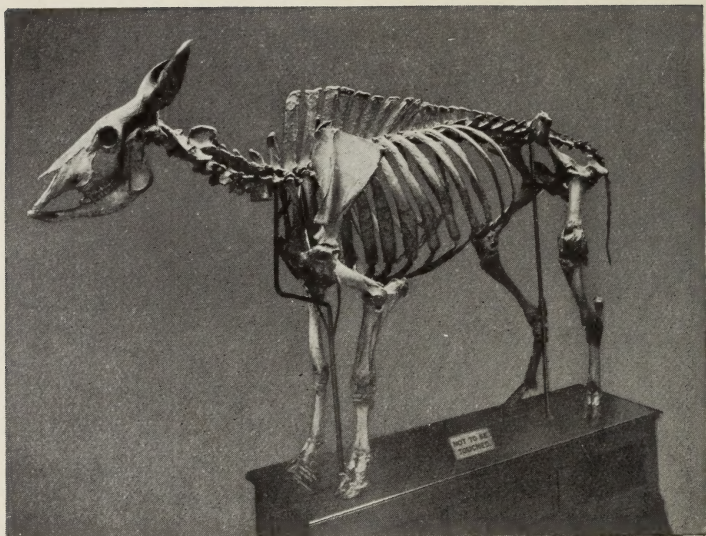


FIG. 1. SKELETON OF PIEDMONT BULL

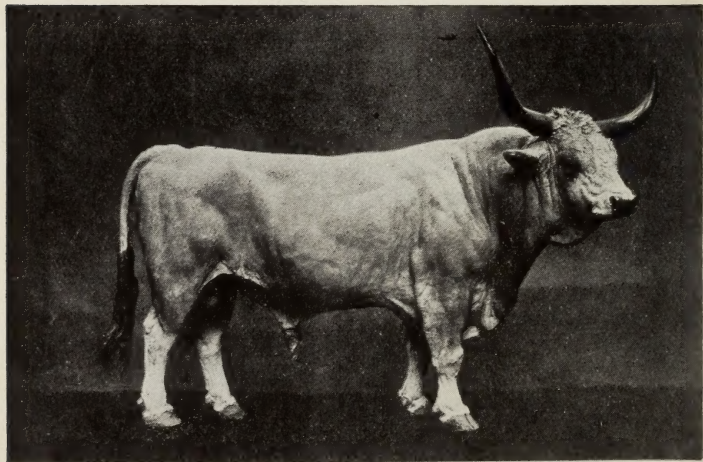


FIG. 2. TRANSYLVANIAN BULL

Ma-L

THE OX AND ITS KINDRED

BY

^{Richard}
R. LYDEKKER

WITH FIFTY-FIVE ILLUSTRATIONS

METHUEN & CO. LTD.
36 ESSEX STREET W.C.
LONDON

[1912]

YEAR 011
W 0100X SM00.2001
L 011 300101 11A0

First Published in 1912

PREFACE

DOMESTICATED cattle are of such paramount importance to mankind that a popular, and at the same time trustworthy, account of what is known with regard to their origin and of the chief breeds by which they are represented can scarcely fail to interest a large series of readers. And I venture to hope that this volume will appeal alike to naturalists, to the owners of pedigree cattle, to cattle-breeders generally, and to archæologists.

Special attention is devoted to the history of the extermination of the great wild ox, or aurochs, of Europe and western Asia, of which, so far as I know, no complete account is to be found in any other English book. The so-called wild white cattle of British parks, whose origin and relationships have been much misunderstood, likewise claim a large share of attention. The same may be said with regard to the humped cattle of Asia and Africa, and their influence on certain European breeds. In this connection I may take the opportunity of mentioning that since the text was written it has come to my notice that, in regarding humped cattle as domesticated derivatives from the wild bantian of south-

eastern Asia, I have been anticipated by Dr. Conrad Keller, who enunciated the same view in his work entitled *Die Abstammung der ältesten Haustiere*, published at Zurich in 1902. That two workers should have arrived independently at the same conclusion adds to the probability of its being true.

The extinct wild ox and the domesticated breeds form the main theme of the book, which would, however, have been obviously incomplete without some account of existing wild cattle. Since, however, I have treated of these very fully in a larger work, the present notice is comparatively brief. Finally, hybrid cattle and extinct cattle form the respective subjects of two short chapters.

To the Trustees of the British Museum and several friends and correspondents I am indebted for many of the illustrations in this volume, the sources of all of which are, I hope, duly acknowledged.

R. LYDEKKER

HARPENDEN LODGE, HERTS

November 1911

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THE OX AND ITS KINDRED

CHAPTER I

THE NAMES OF THE OX AND ITS ANCESTOR

ALTHOUGH it may appear strange to the reader that there should be the slightest hesitation or difficulty in deciding as to what is the proper vernacular name of the well-known animal forming the main subject of the present volume, yet as a matter of fact the difficulty is a very real one. Indeed, the same difficulty is experienced in regard to the English names of many other species of animals; and it accordingly seems extremely doubtful whether our ancestors ever had species-names at all for many of the better-known and larger mammals and birds, contenting themselves apparently with a name for each sex of such species. The human species itself affords a case in point. It is true, indeed, that, in the first chapter of the Book of Genesis, the term "man" is used to denote both sexes, although the expression "in the image of God created he *him*; male and female created he *them*," seems to indicate some hesitation on the part of the translator as to whether this usage was justifiable. But even if it be so, we cannot speak of a "female man," and are thus driven to use some such peri-

phrases as the "human species" when we wish to refer to *Homo sapiens* in a specific sense.

The want of a collective term is still more pronounced in the case of the domesticated ruminant to which the Swedish naturalist Linnæus applied the name *Bos taurus*, as bull is restricted to the male, and cow to the female, while, in addition, there are such terms as steer, heifer, and calf for the immature stages of one or both sexes of the species.

Ox (=the animal that draws) is, indeed, sometimes used as the species-name, while its Saxon plural oxen is constantly employed as the designation of the whole group, although it properly denotes only the castrated male, otherwise known as bullock. Cattle (=chattel, a possession), a word which was originally used both in the singular and the plural, is also often employed in the latter sense; although properly it includes not only "horned cattle," but likewise sheep, goats, horses, and even pigs. It seems, therefore, quite clear that there is no English equivalent to *Bos taurus*; but as we cannot possibly speak of a "female bull," the use of the term "ox" in this sense, although not correct, is a convenient compromise. It is, however, more than doubtful whether it is permissible to speak of a "female ox."

In the languages of Europe words apparently derived from two distinct roots are employed to designate the ox. In ancient Greek we have, for instance, *bous*, which became *bos* in Latin, with the inflective *bovis* in the genitive, from which is derived the adjective *bovine*; this, in turn, formed *bove* or *bue* in modern Italian, and *bœuf* in French. This same root reappears in the Old English term *beeves*, as

equivalent to oxen, in the narrower sense, and likewise in the modern *beef*.

The second root-word is exemplified by the German *ochs*, the Danish *oxe*, and the Saxon and modern English *ox*. The addition of the prefix *ur*, *aur*, or *auer* gives us *urox*, *aurochs*, or *auerochs*, the name of the ancient extinct wild ox, or wild bull, of Europe. According to Professor W. Boyd Dawkins,¹ the word *urox*, or *aurochs*, is derived from the "Sanskrit root *ur*, *aur*, or *or*, that signifies a forest or stony place. The root can be traced through many languages, and still survives in the Greek *oros* (a mountain), the Norwegian *ore*, the Islandic *urd* (the stony desert surrounding the base of the mountains), and is preserved without change in the Old German *ur* (a forest) and in the Biblical 'Ur of the Chaldees.' It appears also in the *Ural* Mountains, and likewise in the canton of *Uri*, the crest of which is an ox-head."

Professor Dawkins regards the word *urox*, *urochs*, *aurochs*, or *auerochs* as equivalent to wild ox or forest ox. A precisely analogous word occurs in the shape of *auerhuhn* or *urhuhn*, the German name of the capercaillie, which according to the above should be regarded as equivalent to wild cock, or forest cock, although in some German dictionaries it is translated mountain cock, as is *auerochs* by mountain ox or mountain buffalo.

In Old German, however, the wild bull is generally, if not invariably, designated simply as *ur* (plural *ure*), *urwer*, or *auer*. Thus in the "Niebelungenlied," the great twelfth-century epic, we find the following lines:—

"Dar nach schluch er schiere, einen Wisent und einen Elch,
Starcher Ure vier, und einen grimmen Schelch,"

which have been translated as follows:—

¹ *Quart. Journ. Geol. Soc.*, London, 1866, vol. xxii. p. 391.

“After this he straightway slew a Bison and an Elk,
Of the strong Uri four, and a single fierce Schelk.”

The passage refers to a great hunt held in the Forest of Worms, the identity of the animal alluded to as *Schelch* being unknown, although it has been suggested that it indicates the great extinct Irish deer commonly miscalled the Irish elk.

But the use of the term *ur* to denote the wild ox is of much earlier date than the “Niebelungenlied,” as it must have been current in the time of Julius Cæsar, by whom it was Latinised into *urus*, and employed as the name of the present species, as distinct from the bison, which is also mentioned in the narrative of the great conqueror. It would seem, indeed, as though *ur*, in the sense of “the wild (animal),” was the original and earlier name, and that the affix *ox* or *ochs* was added later, this idea being confirmed if *ox*, as mentioned above, really means “the drawing beast.” We have an apparently analogous case in the German substantive “wild,” for deer, which is evidently a derivative from the similar adjectival term.

This, however, is not all, for *tur*, or *thur*, the Polish name for the wild ox, is considered to be identical with *ur*; and the same word apparently recurs in *tur*, the name applied in the Caucasus to certain peculiar species of wild goats. Then, again, there appear to be considerable grounds for the belief that the afore-said “UR of the Chaldees” (Genesis ii. chap. 28, ver. 31) is connected with *Uru*, the moon-god;¹ and if this be so, there is an obvious connection between the crescent moon and the horns of the *ur* or *urus*. There is also the Chaldi word *sôr*, meaning cattle, and this, too, may be a derivative from the same root.

¹ See Murray's *Bible Dictionary*, p. 194.

Further, it has been suggested¹ that the Greek *tauros*, a bull, the Latin *taurus*, the German *stier*, and the English *steer* are likewise derivatives from *tur* and *ur*, and therefore originally signified the wild animal. In Hindustani, again, there is the word *gai*, properly denoting a cow, but also applied to oxen generally; and it has been suggested² that this name is the equivalent of the German *kuh* and the English cow. Be this as it may, the word *gai* reappears in combination with the Sanskrit *ur* as the name of the *gaur* (= *gai-ur*), or wild ox of India.

It therefore seems probable that the Scandinavian *urox*, the German *aurochs*, and the Hindustani *gaur* are etymologically the same, and signify wild, or forest, ox; and also that the Old German *ur*, the Polish *tur*, and the Chaldi *sôr* are likewise identical, the first originally signifying merely "the wild animal," which was subsequently particularised by the addition of *ochs*. Whether the prefix *ta* in *taurus* denotes ox (*ta-urus*), like *gai* in *gaur* (*gai-ur*), I am unable to say.

It has to be added that in modern German the prefix *ur*, as in *Uralter*, the early ages, *Urwelt*, the primeval world, denotes antiquity, and that therefore the name *Urochs* might be translated "the ancient ox," or, as it has been rendered, "the ox of yore." Probably this use of *ur* is a later derivative from the original signification of *wild* or *forest*.

In addition to *ur* and *ochs* there are other German words for oxen, such as *rind*, denoting horned cattle in general, and *stier*, and we accordingly sometimes find the *ur* or *aurochs* referred to as the *urrind* or *urstier*, apparently with the significance of "ancient."

¹ Dawkins, *op. cit.*

² *Ibid.*

As will be shown later, the wild ox of Europe became extinct during the Middle Ages, its last refuge being a Polish forest; and after its disappearance the name aurochs—although not ur—became transferred to the bison, which still exists in the Caucasus and central Russia. This misuse of the term aurochs was adopted by the French naturalists Buffon and Cuvier, whose usage was followed in England by Sir Richard Owen, who does not appear to have been acquainted with the fact that the names urus and aurochs are from the same root, and were applied in antiquity to the same animal. This was, however, well known, as indicated above, to Professor Dawkins, which renders it the more strange that he should have followed the practice of employing aurochs to denote the bison and urox or urus for the extinct wild ox.

This practice naturally gave rise to a great amount of confusion; and it is mainly owing to the writings of the late Professor Alfred Nehring, of Berlin, that matters were put right during the closing decade of the nineteenth century, and the name aurochs reinstated in its proper and original signification. Here it may be mentioned that Dr. Max Hilzheimer,¹ who has devoted much attention to living and extinct cattle, refuses to employ the term auerochs, or aurochs, on the ground that in modern German it signifies a castrated male. The same objection applies, as has been already mentioned, to the use of the term ox as the modern English designation of *Bos taurus*.

As regards the scientific, or Latin, designation of the species, there is fortunately no difficulty or

¹ "Wie hat der Ur ausgesehen?" *Jahrbuch der wissenschaftliche und praktische Tierzucht*, 1910, vol. v. p. 42.

ambiguity. As indicated above, Linnæus applied the name *Bos taurus* in his *Systema Naturæ* to the domesticated ox, or cattle, of Europe, of which the typical representative is accordingly the common Swedish breed. Later on, in 1827, Bojanus proposed the name *B. primigenius*, on the evidence of its fossilised remains, for the extinct European wild ox, which he regarded as a distinct species. Since, however, domesticated cattle are the direct, and in most cases but slightly modified, descendants of the wild ox, both are clearly of the same species, and the latter constitutes merely a race of the former, under the name of *B. taurus primigenius*.

CHAPTER II

THE ZOOLOGICAL POSITION AND STRUCTURE OF THE OX

THE ox is a species of the genus *Bos*, and the latter one of the numerous genera included in the family *Bovidae*. Much confusion exists in the popular mind with regard to the meaning of the term "species," as understood by naturalists. Quite recently, for instance, in a Government "Blue book" issued in 1910 and relating to the preservation of African big game, I came across the expression "antelope species," which is simply nonsense, as it is intended to include something approaching one hundred real species. Equally unsatisfactory is the current usage of the term "variety," which is frequently employed in the sense properly belonging to species; indeed, the use of the former term in natural history is better avoided altogether.

A species is really an assemblage of animals of which all the members, apart from sexual peculiarities, agree with one another very closely in general characters, and in the typical locality (that is to say, the locality where the specimen on which the species was first scientifically named was obtained) are practically indistinguishable. In the case of species with a limited geographical distribution, and which have

never been domesticated, this uniformity of character extends to all the individuals. On the other hand, when a species has a very large distributional area, the individuals inhabiting the localities farthest away from one another very frequently differ to a more or less marked degree, as they also do from those inhabiting the centre of the area. In some cases there may be a complete gradation from the typical to the aberrant individuals; but in other instances such connecting links may have died out, and it then becomes very difficult to say whether all the variations should be regarded as referable to a single species, or whether one or more of them should constitute distinct species. When outlying variations are not regarded as worthy of specific distinction, they are classed as local races of the species, and are then designated by three scientific names. In the case of domesticated animals the variation is frequently very much greater; but it is not the general practice of naturalists to assign separate scientific designations to the various breeds, as the variations are called in this instance. In the case of the ox only these domesticated breeds remain to us, one of these, as already mentioned, forming the typical representative of the species.

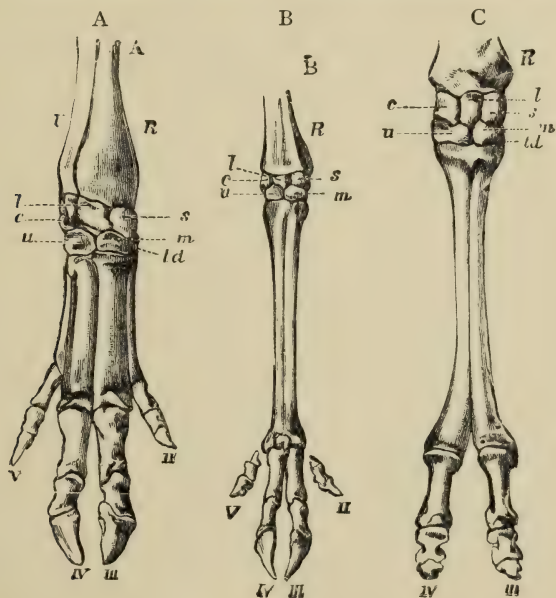
Whether the aforesaid local variations in wild animals should be regarded as of racial or specific value is very largely a matter of individual opinion; and the same is the case with regard to the limitations of genera, or assemblages of more or less nearly related species. Many naturalists divide the members of the ox tribe, which include the extinct ox of Europe and its domesticated descendants, the humped ox of India and Africa, the bantin of the

Malay countries and the gaur of India, the bisons of Europe and America, the yak of Tibet, the buffaloes of India and Africa, and the anoa or dwarf buffalo of Celebes, and collectively constitute the subfamily *Bovinae*, into a number of separate genera. Others, on the contrary, include the whole of them in the typical genus *Bos*, which is separable into subgeneric groups corresponding to the genera of naturalists who adopt the former arrangement. The latter and simpler plan is the one followed in the present volume.

Oxen, in the wider sense of the term, or cattle, as they are perhaps better called, are members of the great order of Ungulata, or hoofed mammals, of which, next to the elephants, hippopotamuses, giraffes, camels, and rhinoceroses, they constitute some of the largest existing representatives, although a few are smaller. Ungulates take their name from the circumstances that the feet of the more typical members of the order are encased in solid hoofs; although in a few cases, as in the elephants and rhinoceroses, these hoofs are replaced by large, flattened nails. In correlation with these hoofs or hoof-like nails, which do not admit of the fore-limbs being used as grasping organs, the fore-limbs themselves are so constructed that each is capable of movement in only a single plane, the feet having lost the power of supination possessed by the fore-paws of Carnivora and monkeys. This single character is practically sufficient to distinguish the Ungulata, which include its largest living terrestrial representatives, from all other members of the mammalian class.

Exclusive of elephants and the small Syrian and African mammals known as hyraxes, which are in many respects what naturalists call generalised types,

existing ungulates are divisible into two main groups, or suborders, namely, the odd-toed ungulates, or Artiodactyla, among which the ox is included, and the even-toed ungulates, or Perissodactyla, of which



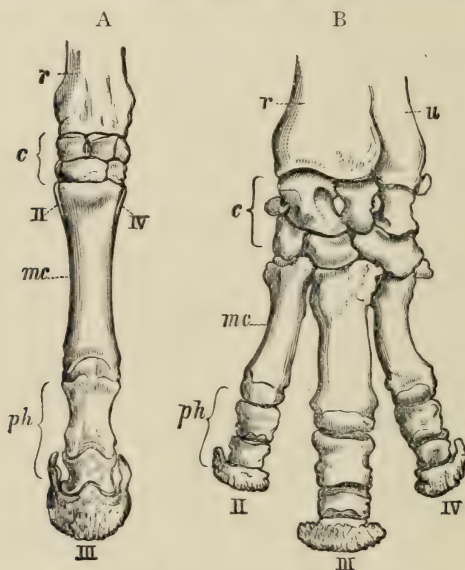
BONES OF THE RIGHT FORE-FOOT OF A PIG (A), A DEER (B)
AND A CAMEL (C)

U, ulna, or larger leg-bone ; *R*, radius, or smaller leg-bone ; *l*, *c*, *u*, *s*, *tm*, *td*, bones of the wrist or carpus ; below these are the metacarpals, fused in *B* and *C* into a cannon-bone ; II, III, IV, V, toe-bones (after Sir W. H. Flower).

the horse and the ass are the two domesticated representatives.

The Artiodactyla, or even-toed group, take their name (compounded from the Greek *artios*, equal, and *dactulos*, a finger or toe) from the circumstance that

two of the toes in each limb, corresponding in the fore-limb to the third and fourth fingers of the human hand, and in the hind-limb to the third and fourth toes of the human foot, form a symmetrical pair on



BONES OF THE LEFT FORE-FOOT OF A HORSE (A) AND A RHINOCEROS (B)

u, ulna ; *r*, radius ; *c*, wrist or carpus ; *mc*, metacarpals, or, in the horse, cannon-bone ; *ph*, toe-bones ; the numerals II, III, IV refer to the numbers of the toes as compared with those of the primitive five-toed foot ; in the horse the lateral toes are represented only by the upper ends of metacarpals II and IV. (From "British Museum Guide to Great Game Animals.")

either side of a vertical line drawn between them. In most cases these two toes or hoofs are flanked, as in the ox, by a smaller pair representing the human second and fourth fingers and toes ; but in some rare instances, as in the giraffe and certain antelopes, they

are the only ones. In no existing artiodactyle (and, for that matter, in no living perissodactyle) is there a toe corresponding to the human thumb or to the human great toe.

In the Perissodactyla (Greek *perissos*, unequal, and *dactulos*), on the other hand, the toe corresponding in the fore-limb to the human third or middle finger, and in the hind-limb to the human third toe, retains the character of being symmetrical to a line drawn through its own axis, and of being longer and larger than the toes on either side. In the horse and its immediate relatives, which constitute the supreme, or most specialised, representatives of the odd-toed group, the third toe, which is greatly enlarged, is the only one remaining.

It is necessary to add, without entering further into the details of the ungulate skeleton, that in the more advanced, or specialised, members of the even-toed group, the two enlarged and mainly functional toes in each limb are supported by an elongated bone—the cannon-bone—formed by the fusion of the two bones which respectively support the third and fourth fingers of the human hand and the corresponding segments in the human foot. In the horse, on the contrary, the single toe in each limb is supported by a cannon-bone of simple, instead of compound, structure.

Both in the ox and in the horse the cannon-bone is greatly elongated in comparison with the bones or bone by which it is represented in the pig among the artiodactyles and the rhinoceros among the perissodactyles. This elongation of the cannon-bone, in both these animals, causes the wrist and ankle joints—the former being the so-called “knee” and

the latter the "hock" of the horse—to be raised far above the level of the ground. In primitive extinct ungulates, on the other hand, in some of which there were five toes to one or both pairs of limbs, the wrist (carpus) and ankle (tarsus) joints were much nearer the ground, and the cannon-bone was represented by four or five separate and comparatively short bones.

The reason for the elongation of the upper, or, as it would be called in man, the hind, part of the skeleton of the feet, and the replacement of the original five comparatively short bones known in the fore-limb as the metacarpal, and in the hind-limb as the metatarsal bones by a single elongated cannon-bone—of dual origin in the ox, but formed of one element in the horse—is to permit of large and heavy animals running at a high rate of speed without danger of fracturing the bones of this part of the skeleton and at the same time to secure a slender but likewise a strong type of limb. Such a result could never have been attained by elongating the bones of a five-toed limb.

As regards their foot-structure, the ox and the horse have independently attained the same goal, but by different routes; the one by the enlargement of the third and fourth toes (accompanied by the diminution in the size of the lateral ones) and the elongation and fusion of their supporting metacarpal and metatarsal elements into a compound cannon-bone, and the other by the enlargement of the middle toe and the complete suppression of the lateral ones, accompanied by the lengthening and strengthening of the simple cannon-bone.

It is frequently stated that in these respects the horse and its relatives are the most specialised of all

living mammals; but a little consideration will show that the ox, together with all the other members of the family *Bovidæ*, and likewise the giraffe and deer tribes (*Giraffidæ* and *Cervidæ*), is really entitled to this position. For whereas in the former, as shown above, the specialisation is restricted to the middle toe and the corresponding metacarpal and metatarsal bones, without any essential modification of form or fusion of elements, in the latter there has been profound alteration in the shape of the two enlarged and modified toes, and likewise a complete amalgamation, in the respective limbs, of the corresponding metacarpal and metatarsal elements.

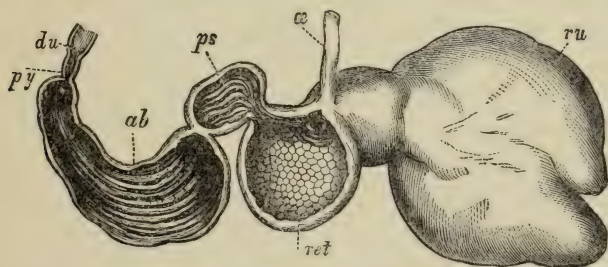
Compared with their extinct polydactyle fore-runners, the ox and the horse have, on their own respective lines, attained practical perfection in regard to the structure of the bones of the foot; and whereas it would be perfectly easy to suggest modifications in the structure of the skeleton of the feet of polydactyle animals, such as the rhinoceros, the hippopotamus, or the dog, no such modification could be suggested in the skeletal structure of those of the ox and the horse, save the elimination in the former of the small second and fifth toes—which, as mentioned above, has actually been accomplished in the case of certain antelopes and the giraffe and okapi—and in the latter of the so-called splint-bones, or remnants of the second and fourth metacarpals and metatarsals. In foot-structure the giraffe, the prongbuck, and the pala antelope are, therefore, not only more specialised than the ox, but even than the horse. The retention of the lateral toes in the ox is probably due to the fact that this animal lives on softer ground than the giraffe.

Here it may be mentioned, as a decidedly remarkable fact, that whereas the members of the *Perissodactyla* which exhibit the type of foot-structure characteristic of the horse are very few in number—comprising, in fact, only the horse, the ass, the kiang, chigetai, and onager of Asia, and the zebras and quaggas of Africa—the representatives of the *Artiodactyla* displaying the ox-like modification of foot-structure are extremely numerous, including not only the ox and its immediate relatives, but likewise sheep, goats, antelopes, the American prongbuck, the giraffe and okapi, and the great host of deer.

Although much more might be added in regard to the structure of the *Artiodactyla* as a whole, the foregoing will suffice for the purposes of the present work; and reference may now be made to some of the leading features of the major and minor divisions of that group in which the ox is included.

In common with a large number of other even-toed ungulates, the ox and its immediate relatives are endowed with the power of ruminating, or “chewing the cud”—a function rendered possible by the peculiar structure of the stomach, which, as shown in the figure on next page, typically consists of four distinct compartments, or chambers, the first of which, known as the paunch, or rumen, lies on one side of the gullet, while the other three—connected together by narrow channels of communication—occupy the opposite aspect. When the grass or other herbage upon which ruminants—as the animals endowed with the power of chewing the cud are collectively termed—feed is plucked by the mouth, it is hastily swallowed and transferred to the paunch, where it is suffered to remain till such

time as the animals have completed their feeding, and retired to repose and digest their meal. Before the digestive process can take place, the food has, however, to be regurgitated from the paunch to the mouth, where it is subjected to complete mastication by means of the powerful series of mill-like cheek-teeth characteristic of all ruminating artiodactyles. After this process has been accomplished, the thoroughly chewed food is once more swallowed,



STOMACH OF A SHEEP, PARTIALLY CUT OPEN TO SHOW THE INTERNAL STRUCTURE

ce, cesophagus, or gullet; *ru*, rumen, or paunch; *ret*, reticulum, or honeycomb; *ps*, psalterium, or manyplies; *ab*, abomasum; *py*, pylorus; *du*, duodenum, or commencement of the small intestine. (From "British Museum Guide to Great Game Animals.")

and passed, not into the paunch, but into the true stomach, or reticulum, where it undergoes the greater part of its digestion, subsequently passing in turn into the other two chambers, where the process is completed, and finally into the small intestine or bowel. When a ruminant is engaged in chewing the cud, after a mouthful of food has been masticated and swallowed, the animal, as may be noticed by watching a herd of recumbent cows shortly after their meal, will remain perfectly still for a few

seconds, after which a kind of convulsive movement will be observed in the throat, followed by the sudden upward movement of a "bolus" through the gullet; this bolus being a mass of grass or other food conveyed with spasmodic rapidity from the paunch to the mouth owing to the reversal of the direction of the normal "peristaltic," or wave-like, movements of the walls of the gullet.

Although this is not the case with the wild members of the ox-tribe, many ruminants are timid and more or less defenceless animals—or, at all events, practically defenceless against the rush of the larger Carnivora—whose sole security from attack rests on the rapidity of their flight. Now if they were to chew their food as it is gathered, they would have to remain a comparatively long time on their feeding-grounds, where they are necessarily most exposed to danger; but, thanks to the ruminating function, they are enabled to snatch a hasty meal—without the injurious results which occur in the case of the City clerk who resorts to the same practice—and retire to a place of security for its mastication and digestion; these, as already mentioned, being carried on during a period of needful repose.

The ruminating function, however, is by no means confined to the ox and the other members of the bovine family, but is common also to their near relatives the giraffe and deer, and likewise to their much more distant relations camels, llamas, and chevrotains or mouse-deer. Among the latter, chevrotains, which are in some respects more nearly akin to pigs than to deer, and have neither horns nor antlers, differ from the ox and other typical ruminants by the simpler structure of the stomach,

which has only three chambers, owing to the absence of the manyplies. The lateral pair of metacarpal and metatarsal bones (second and fifth) are, moreover, complete, as in the pig (see figure on page 12), although of a more slender type, which is never the case among typical ruminants; and in the case of one of the two living genera, as represented by the African water-chevrotain, the two middle metacarpals do not coalesce into a cannon-bone, but remain separate throughout life. There are several other features by which the skeletons, and likewise the teeth, of chevrotains differ from typical ruminants, but the characters mentioned are amply sufficient to distinguish the group, which is technically known as the Tragulina, from the latter.

A second sectional group of ruminating mammals is represented by the camels of the Old World and the llamas of South America, which have two-toed cushion-like feet, with broad nails instead of hoofs, and are hence collectively called Tylopoda. From typical ruminants these animals are further distinguished by the presence in the young state of three pairs of incisor, or front, teeth, of which the outer pair normally persists throughout life; and likewise by the absence of a distinct manyplies, or psalterium, to the stomach, which is thus three-chambered, as in chevrotains. Again, although in the fore-foot the two remaining metacarpals, corresponding to the third and fourth of the typical series of five, as shown in the illustration on page 12, are fused into a cannon-bone, as are likewise the corresponding metatarsals in the hind-limb, yet the cannon-bones thus formed differ from those of the ox and other typical ruminants by the marked

divergence of their lower extremities, which lack pulley-like ridges for articulation with the uppermost toe-bones. The toe-bones themselves are likewise decidedly different from those of the typical ruminants, as may also be seen in the same figure, and do not show the markedly paired character so distinctive of the latter. As this book is not a natural history of the ungulates, or even of the artiodactyles, these few features will suffice to distinguish the Tylopoda from other ruminants.

Having now eliminated two somewhat aberrant groups of ruminants, it remains to indicate some of the leading features of the typical section of that assemblage of artiodactyle ungulates technically known as the Pecora, or cattle-like ruminants, among which is included the ox.

These Pecora are collectively characterised by the presence of four separate chambers in the stomach (see figure on page 17), by the absence of incisor teeth in the front of the upper jaw, and by the pair of lower canines and the three pairs of lower incisors forming a closely approximated series of eight very similar teeth arranged somewhat in the shape of a bow, and having when unworn more or less chisel-shaped or spatulate crowns, these biting against a callous pad on the toothless front of the upper jaw. The cheek-teeth of both the permanent and the milk, or deciduous, series have also a peculiar and characteristic type of structure, although this is shared, with some modifications, by the chevrotains and camels, and likewise, in a less specialised degree, by certain extinct groups of artiodactyles not generally termed ruminants, although some or all of them probably chewed the cud in ruminant-fashion.

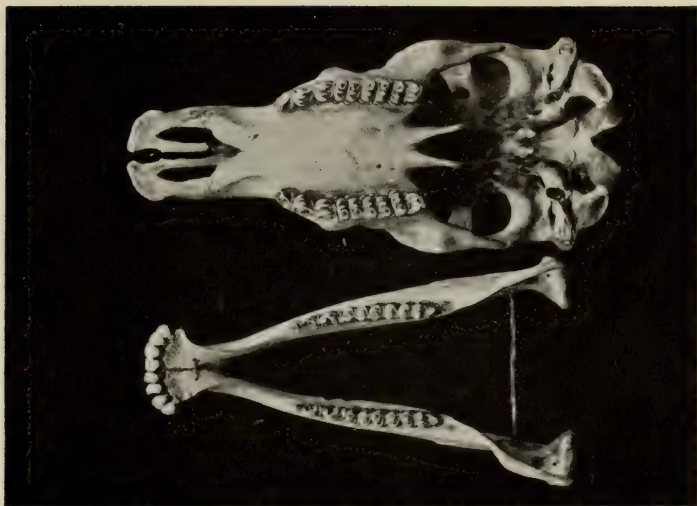


FIG. 1. SKULL AND TEETH OF POLLED OX

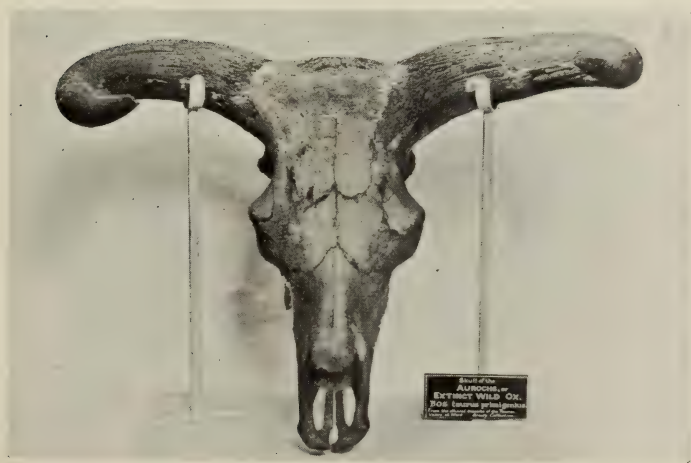


FIG. 2. SKULL OF AUROCHS

In the adult condition there are normally, as in the ox, six pairs of these teeth in each jaw, of which the three foremost are simpler in structure than the others, and are preceded by milk-teeth, these being called premolars. The last three pairs, on the other hand, have no deciduous predecessors, and are known as molars. Taking first the premolars, the crowns of these teeth may be described as consisting of two vertical columns, one on the outer and the other on the inner side, the latter being crescentic in form, with the horns of the crescent directed outwardly. The upper molars are more complicated, and consist of two pairs of somewhat smaller but practically similar columns, with the crescents of the inner pair likewise directed outwardly. In the upper molars the surface of the crown is either nearly square or oblong, and the height may, as in the ox, be very considerable ; while the varying hardness of the three constituents of which the tooth is formed makes a rough and irregular surface admirably adapted for masticating grass, twigs and leaves, or grain. The central portion of each column is formed internally by a comparatively soft substance termed dentine, externally to which is a layer of hard flinty enamel, while in the hollows between and around the columns is spread the third constituent, known as cement. When a tooth of this type is gradually worn away by grinding against the teeth of the lower jaw, it will be obvious that the surface will present alternations of these harder and softer materials. In all the Pecora the cheek-teeth develop roots, and are then incapable of further growth ; and it may be assumed, *primâ facie*, that the higher the crowns of these teeth, the longer the life of their owner, although

this generalisation is dependent to a greater or less degree on the relative degree of hardness or softness of the food.

The lower cheek-teeth, although narrower, are practically reversed replicas of the upper ones, the crescents being situated on the outer side of the crown, and their horns being in consequence directed inwardly. In nearly all cases, however, the last pair of lower molars consists of three, in place of two, lobes, the additional third and hindmost lobe being mainly formed solely by the outer crescent-shaped column. In the reindeer this third lobe of the last lower molar is very small, and in some of the small African antelopes known as dik-diks it is altogether wanting.

From the crescentic form of one pair of columns in each molar, this type of dentition has been designated *selenodont*, from the Greek *selené*, the name of the crescent moon, and *odous*, with the genitive *odontos*, a tooth.

As the main features of the constituent bones of the typical ruminant foot have been already sufficiently discussed in an earlier part of the present chapter, it is only necessary to add that in the hind-limb the two elements of the ankle-joint, or tarsus, respectively known as the navicular and the cuboid, are fused into one large compound bone known as the naviculo-cuboid, this fusion conferring additional strength and solidity to this part of the skeleton. This feature is, however, not peculiar to the true ruminants, but is shared by the chevrotains, although not by the camels. It may also be mentioned that the terminal bones of each of the two main (and in certain instances the only) toes are encased in solid horny hoofs of the type commonly known as cloven,

that is to say, in which each hoof is symmetrical to a vertical line between it and its fellow, instead of being, as in the horse, symmetrical in itself. As regards the skeleton other than that of the feet, it is important to mention that the second, or axis, vertebra of the neck in all ruminants is articulated to the first, or atlas, vertebra by means of a short spout-like projection, with its concavity facing upwards, arising from the front margin of the basal portion of the bone. This spout-like articular process of the axis vertebra is, however, not absolutely peculiar to the Pecora, as it recurs in the camels and llamas, while it is also foreshadowed in the horse and the tapir, although in those animals it is not so completely spout-like. In the chevrotains and the pigs and hippopotamuses, on the other hand, the articular process of the axis is peg-like, or tooth-like, as it is in the human species; and it is from this tooth-like form in the latter that this appendage has received its name of odontoid process.

In the typical ruminants the spout-like form of the odontoid process is doubtless designed to counteract the great leverage on the neck caused by the long and heavy horns or antlers borne by at least the males of so many of these animals, a similar structure being necessary in the case of the camel, where the neck is long, the vertebræ comparatively slender, and the head heavy. It might be urged that such a structure would be equally essential to the hippopotamus and rhinoceroses, in which the head is of great weight, and in the case of the latter animals furnished with horns which sometimes attain a great length and weight. Here, however, the necessary strength is supplied by the great

massiveness of the vertebræ. The tendency to the assumption of a spout-like form in the odontoid process of the axis vertebra of the horse is a second instance of that parallelism in development between the members of the equine family and the typical ruminants which is still more pronounced in the skeleton of the feet.

A third instance of such parallelism is afforded by the cup-and-ball articulations of the five vertebræ of the neck situated behind the axis in the Pecora and the members of the horse family, this structure being likewise designed (I use the word advisedly) to confer additional strength on the neck. In both the ox and the horse the cup is situated at the hind end and the ball at the front of each of these vertebræ.

Other characteristic features of the ruminant skeleton are to be found in the bones of the lower part of the legs, where specialisation has been carried to the greatest extent in the hind-limbs. In the case of the fore-legs the ulna, or larger bone, has become more or less rudimentary and incomplete inferiorly, while its upper end is firmly welded to the upper portion of the radius, or (typically) smaller bone, which is now the chief constituent element of this portion of the limb. This modification, which is also paralleled in the horse, is designed to confer strength combined with lightness to the leg. In the hind-limb the fibula, or smaller bone of the lower segment of the leg, is represented only by its two extremities, of which the upper forms a small pointed style welded above to the corresponding end of the tibia, or larger bone, while the lower extremity is represented by a detached nodular bone lying on the outer side of the lower end of the tibia. In the horse this

reduction of the fibula has been carried to a still greater degree, only the upper portion remaining as a small pointed rod of bone welded to the outer side of the upper end of the tibia—yet another example of parallelism between ruminants and the horse tribe.

None of the foregoing skeletal features is, of course, observable in the living animal, but there is one very distinctive external character common to at least the males of all existing species of the typical ruminants in a wild state, with the exception of certain small kinds of deer, such as the musk-deer and water-deer of Asia. This is the presence on the upper part of the head of paired appendages, known in the case of deer as antlers, and in that of the members of the bovine family as horns, the nature of these appendages serving to divide the typical ruminants into three or four distinct families.

In the case of the deer family, or *Cervidæ*, in which, with one exception, they are restricted to the males, these appendages take the form of outgrowths of bare bone, occasionally as mere spikes, but generally divided up into a smaller or greater number of branches. These antlers, as they are best called, in order to distinguish them from the horns of the ox and its relatives, grow from permanent, skin-covered prominences, or pedicles, arising from the frontal bones of the skull, and are themselves at first covered with a velvety skin, which subsequently dries up and is rubbed off. These antlers are shed and renewed every year, or at least every few years; and their presence, coupled with certain structural features which need not now be mentioned common to the species unprovided with these appendages, serves to differentiate the *Cervidæ* from the bovine ruminants.

A second family (*Giraffidæ*) is formed by the giraffes and okapi, in which the horns take the form of permanent skin-covered prominences comparable to the pedicles of the deer, and in the case of the male okapi surmounted by small caps of bare bone representing the cervine antler.

A third type is represented solely by the North American prongbuck, or prong-horned antelope, in which the appendages take the form of forked hollow sheaths of horn borne on unbranched bony cores arising from the frontal bones, the cores themselves being permanent, but the sheaths annually shed. The whole structure, core and sheath together, forms the horn. Very generally the prongbuck is regarded as forming a family by itself—the *Antilocapridæ*; but some naturalists are of opinion that it should be classed as a subfamily of the bovine group. Whichever view be preferable, it is simpler to regard the species as representing a family.

The remaining members of the typical ruminants constitute the family *Bovidæ*, of which the ox itself is the type. In all these animals the horns are of the same general type as those of the prongbuck, but their sheaths are unbranched and retained throughout life. The simplest type is that of the little African duikerboks, in which the horn forms a simple spike with a solid core. The more complicated spiral and ridged horns, like those of the kudu of Africa, appear to have been modified to resist strain and torsion; but among these there is great variation, the cores of some, like the Russian saiga antelope, being solid throughout, while those of others are spongy in internal structure.

It will frequently be found convenient to allude

to the members of the family *Bovidæ* collectively as the hollow-horned ruminants, since the term bovine ruminants is a somewhat ambiguous one, being applicable either to the ox and its immediate relatives or to the family as a whole. In addition to oxen, sheep, goats, antelopes, musk-oxen, and chamois are members of the family.

The reader will now be in a position to understand the position occupied by the ox in the animal kingdom, which may be shown in tabular form as follows :—

Subkingdom VERTEBRATA—Vertebrates, or
Back-boned Animals.

Class MAMMALIA—Mammals.

Order UNGULATA — Hoofed Mammals, or
Ungulates.

Suborder ARTIODACTYLA—Even-toed Un-
gulates.

Section PECORA—Typical Ruminants.

Family BOVIDÆ—Hollow-horned Ru-
minants.

Subfamily BOVINÆ—the Ox Tribe.

Genus *Bos*—Oxen, Bison, and
Buffaloes.

Species *Bos taurus*—the Ox.

Subspecies (a) *Bos taurus*
typicus—the Domesticated
Ox of Sweden.

Subspecies (b) *Bos taurus*
primigenius—the Extinct
Wild Ox.

The ruminants constituting the subfamily *Bovinæ*, all of which are included in this volume in the genus *Bos*, and may be collectively designated oxen, in the

wider sense of that term, are heavily built and for the most part large animals, carrying the moderately long neck nearly in the line of the back, with long, straight faces, terminating in broad, naked, and moist muzzles, in which are perforated the nostrils, and the skull of both sexes of the existing species (with the exception of the so-called "polled" domesticated breeds) carrying horns. These horns, which may be either cylindrical or triangular, are usually curved more or less upwards, forwards, and outwards, and finally inwards, but extend nearly straight outwards in one race of the Indian buffalo, and in the dwarf buffalo, or anoa, of Celebes, rise obliquely upwards and outwards without any distinct curvature. In the more typical members of the group, like the ox, the horns, which are more or less nearly cylindrical, are comparatively smooth; but in the buffaloes they are triangular and marked near the base by transverse ridges. In no case, however, have they the fine transverse wrinkling found in those of most wild sheep, or the knobs characteristic of ibex and, in a less degree, the wild goat. Neither are they ever twisted into a corkscrew-like spiral, as in certain antelopes and one kind of wild goat. The two horns are situated far apart from one another at their bases, and rise on or near the vertex of the skull, but in several of the races of the African buffalo they are expanded at their bases into a large helmet-like mass almost completely covering the upper part of the forehead.

The neck, which, as already mentioned, is carried nearly in the line of the back, is deep, and the throat frequently furnished with a large dewlap. In the ox itself the back is nearly straight and the body deep,

while the limbs are short and thick; but other species may have a ridge or hump on the withers. The long tail is usually furnished with a tuft of hair at the tip.

The cheek-teeth are characterised by the great height of their crowns, which in the upper molars are nearly square in section, and have an additional slender column on the inner side between the two crescentic main columns.

A large number of ruminants are characterised by the possession of what are known as skin-glands on the face or limbs, or in both together, the position of such glands being frequently indicated by the presence of tufts of hair longer than that clothing the rest of the face or limb. When these glands—which secrete a highly odorous fluid—are present on the face, they usually take the form of pits, or sacs, opening on the surface by means of narrow orifices; and the same is the case with the so-called inter-digital, or hoof, glands, which open either between the two main hoofs, or a little above them on the front of the foot in the line of their cleft. When such hoof-glands are present the cleft between the two main hoofs extends a long way upwards. On the other hand, the glands which occur higher up on the legs of many antelopes and deer—but more especially the latter—do not take the form of pits, but are constituted by a special thickening and softening of the skin. There may also be glands in the groin. Apart from those of the face, these glands, by leaving their scent on the grass or ground, appear intended to aid the members of a species in finding the whereabouts of their fellows.

Now it is not a little remarkable that such glands

are totally wanting on the face, limbs, feet, and groin of all kinds of cattle, as they are also in certain of the larger antelopes, such as eland. Moreover, the feet of cattle are cleft only for a very short distance above the hoofs—a feature which is probably due to the need in such beasts for a firmer type of foot than that suitable to animals living on softer ground, where lateral expansion of the hoofs is an advantage.

As regards the total absence of all specialised skin-glands in cattle, Mr. R. I. Pocock¹ has suggested that “large ruminants are much more easily kept in view by members of their own tribe than small; or if they live in thick bush, are more easily followed by hearing, as they crash away in a state of panic through the vegetation.” Accordingly they do not need a strong scent to be left on the track along which they have to pass; or, at all events, they have to do without the glands for this purpose.

In addition to this total absence of specialised skin-glands, cattle are characterised by the presence of four teats to the udders of the females.

In the domesticated ox the coat is short and sleek, but that of the bison is much longer and rougher in winter, and the Tibetan yak has a mass of long hair fringing the flanks and the tail likewise clothed with hair of a similar type.

There is a slight variation in regard to the number of the ribs in the different species of cattle. In the ox itself the number of neck, or cervical, vertebræ is seven, as in very nearly all mammals; these are followed by thirteen rib-bearing, or dorsal, vertebræ, and these again by the six ribless, or lumbar, vertebræ of the loins. Then come the five united vertebræ

¹ *Proc. Zool. Soc. London*, 1910, p. 983.

collectively forming the haunch-bone, or sacrum ; and the series is completed by the twenty caudal vertebræ of the tail. In the bison, on the other hand, the number of dorsal vertebræ is increased to fourteen, with a reduction in the number of lumbar, or trunk, vertebræ is nineteen throughout the genus, as it is in the Artiodactyla generally. The number of vertebræ in the tail varies, however, from fifteen to eighteen or twenty, according to the species.

It should be added that in all the members of the *Bovidæ* the upper tusks, or canine teeth, are wanting, although they are retained in the deer. Further, the lateral metacarpals in the fore-limb and the corresponding metatarsals in the hind-limb have completely disappeared, so that the toe-bones have no bony supports. In the deer tribe, on the other hand, either the upper or lower ends of the metacarpals persist, the latter condition being shown in the woodcut on page 11. Large tusks, or canines, are present in the upper jaw of the males ; and the cheek-teeth have low crowns, so that the bases of the hollows between the four columns are visible even in the unworn condition.

In the days when the aurochs, in company with the bison, roamed the great forests of Europe, members of the ox tribe were distributed over temperate and tropical regions of all the continents of the world, with the exception of South America and Australia. North America has, however, only the American bison (together with several more or less nearly allied extinct species or races) ; while in the highlands of central Asia the group is represented solely by the yak, and in Africa by one of the two

larger species of buffalo, the other being Indian. The group was undoubtedly of Old World origin, the American bison and its extinct relatives being comparatively recent immigrants into the New World, which they reached by means of a land-bridge in the neighbourhood of what is now Bering Strait.

Geologically the oxen are a comparatively modern group, their oldest known representatives occurring in the Lower Pliocene rocks of the Siwalik Hills of northern India, in which they are represented by species more or less nearly related to the typical ox, and by others akin to the dwarf buffalo, or anoa, of Celebes. In the succeeding Lower Pleistocene rocks of the valley of the Narbada occur oxen characterised by their slender build, the low relative position of the horns on the skulls of the bulls, and the absence of these appendages in the cows, both these features indicating an approximation to antelopes. Another representative of these oxen with hornless females, which constitute the subgenus *Leptobos*, has left its remains in the Pliocene strata of the Val d'Arno, Italy.

In regard to the nearest living relatives of the oxen group, it is practically certain that these are to be sought among the antelopes.

The remarkable resemblance existing between the horns of the African gnus, more especially the brindled or blue species (*Connochaetes taurinus*), and those of cattle, has frequently formed the subject of comment, although the general opinion has been to the effect that this resemblance is not indicative of close genetic affinity between the two groups. The case is, however, somewhat altered by investigations into the anatomy of the soft parts of ruminants

undertaken by Professor E. Lönnberg, of Upsala, the results of which are published in vol. v., No. 10, of *Arkiv för Zoologi*. The ox and other cattle are characterised by the relative shortness of the large as compared with the small intestine, and the only ruminants in which Professor Lönnberg has been able to discover a similar relation are the gnus, in one species of which the length of the small intestine is only about one-fourth that of the long one. Such a resemblance may of course have been acquired independently; but in view of other features it seems, in the opinion of Professor Lönnberg, more probable that it indicates the common ancestry of the two groups at no very distant date. If this be true, it opens up the question also as to the relationship existing between the antelopes of the oryx group with the gnus on the one hand and with cattle on the other. For it is a curious fact that while gnus have long and narrow upper molars, like those of sheep, the members of the oryx group are unique among antelopes in possessing squared and tall upper molars, with an additional inner column, very similar to those of the ox. How to explain these differences and resemblances is no easy matter. If, however, gnus be really near relatives of oxen, it would seem evident that the former branched off from the common stock before the latter acquired their present type of dentition. On the other hand, if the similarity of their molars is not a feature which has been independently acquired in two groups, the members of the oryx tribe ought to have diverged from the ox group at a later date than did the gnus, and yet their intestines and horns are totally unlike the bovine type. For the present, therefore, the exact

nature of the relationship of oxen to antelopes must remain an open question.

The genealogy, or "family tree," of the ox, in common with the other members of the *Bovidæ*, is much less well known than is that of the horse and its relatives. In the opinion of the late Professor Carl Zittel,¹ of Zurich, one of the greatest authorities on fossil mammals, both the hollow-horned ruminants and deer are descendants of primitive animals from the middle and lower (Oligocene and Eocene) Tertiary rocks of Europe more or less nearly allied to the modern chevrotains, and included in the same family, that is to say, the *Tragulidæ*. The genus which probably formed the ancestral stock is known by the name of *Gelocus*, and includes small chevrotain-like ruminants, in which the radius and ulna in the fore, and the tibia and fibula in the hind, leg are complete and separate; but the navicular and cuboid bones of the ankle, or tarsus, are fused together, as in the typical ruminants. On the other hand, the main pair of metacarpal bones in the fore-limb remain separate, but in the hind-limb the corresponding metatarsals may either be separate or may amalgamate into a cannon-bone, the former condition obtaining in one species, and the latter in a second. The lateral pair of metacarpals and of metatarsals are represented by splint-like remnants of both their upper and lower extremities. An allied Oligocene genus, *Prodremotherium*, has complete cannon-bones in both limbs, and thus serves to connect *Gelocus* with the modern chevrotains. The former genus is known to have lacked upper incisors, but whether these teeth

¹ "Handbuch der Palæontologie,—Mammalia," Munich and Leipsic, 1891-1893, p. 324.

were likewise wanting in *Gelocus* does not appear to be ascertained.

Gelocus and the other *Tragulidæ* are believed to trace their ancestry to *Pantolestes*, a small generalised ungulate from the Lower Eocene rocks of North America, of which only the cheek-teeth and some of the bones of the hind-foot were known when Professor Zitell's treatise was written. The upper molars have very low, somewhat triangular crowns, each carrying three blunt tubercles, arranged in a triangle, with two smaller subsidiary ones, this type of dentition being known as the bunodont, from the Greek *bounos*, a hillock, and *odous*, a tooth. Very probably the feet were severally furnished with four toes; and the navicular and cuboid bones of the tarsus are known to have been distinct, while the fibula of the leg articulated with the calcaneum of the tarsus in the manner characteristic of mammals with unspecialised feet, such as man and the dog. The *Pantolestidæ*, as the family to which the one known genus belongs has been named, represents the most primitive and generalised of all the Artiodactyla, and the one which has given origin to all the rest.

The Lower Eocene strata of North America have, however, yielded the remains of a still more primitive type of ungulates, namely, *Phenacodus*, of which the entire skeleton is fortunately known. This was a small animal with five-toed feet, in which the entire sole was applied to the ground in walking, in what is known as the plantigrade fashion, as exemplified by bears, as distinct from the digitigrade style, in which, as seen in dogs, walking is done on the toes alone. The two rows of small bones of the wrist-

joint, or carpus, are arranged in three vertical series with their constituents lying immediately one above the other, instead of alternating in the manner characteristic of both Artiodactyla and Perissodactyla. The teeth include the full mammalian number of forty-four; and those of the cheek series are of the hillock-crowned, or bunodont, type.

Phenacodus is regarded as the typical representative of a suborder—the Condylarthra—equal in rank to the Artiodactyla and Perissodactyla, of which it has been regarded as the common ancestor, although this is not admitted by all naturalists. If, however, the genus be ancestral to the even-toed ungulates, it will form the lowest grade in the genealogy of the ox which can at present be definitely identified.

CHAPTER III

THE WILD OX AND ITS EXTERMINATION

THE earliest historical evidence we possess of the former existence of the wild ox or aurochs in western Europe is contained in Julius Cæsar's *De Bello Gallico*, book vi. chap. xxix., where the following passage occurs:—

“Tertium est genus eorum qui uri appellantur. Hi sunt magnitudinæ paulo infra elephantos, specio et colore et figurâ tauri. Magna vis eorum et magna velocitas; neque homini neque feræ, quam conspexerunt, parcant. . . . Amplitudo cornuum et figura et species multum à nostrorum boum cornibus differt.”

This may be freely translated as follows:—

“There is a third kind of these animals which are called uri. In size these are but little inferior to elephants, although in appearance, colour, and form they are bulls. Their strength and their speed are great. They spare neither men nor beasts when they see them. . . . In the expanse of their horns, as well as in form and appearance, they differ much from our [domesticated] oxen.”

The wild oxen referred to in this passage—which was written about the year 65 B.C.—inhabited the great Hercynian Forest, the *Hercynia* or *Orcynia Silva*,

which covered at that time nearly the whole of Germany, and of which the name is still preserved in Harz and Erz. It included the modern Teutoburgerwald, Thuringerwald, and the Schwarzwald, or Black Forest.

Another Latin writer, Seneca, alludes to the wild ox in the following lines:—

“Tibi dant variæ pectora tigres,
Tibi villosi terga bisontes,
Latisque feri cornibus uri,”

which may be rendered in English—

“To thee the striped tigers present their breasts, to thee the shaggy bisons offer their backs, and likewise the fierce aurochs with their wide-spreading horns.”

Pliny, again, distinguishes the “jubatos bisontes” (maned bisons) from the “excellenticque vi et velocitate uros” (the aurochs excelling in strength and speed).

The last two extracts clearly show that the ancient Romans were perfectly well acquainted with the difference between the aurochs and the bison; and in this connection it is interesting to note that, according to a paper contributed by Professor E. Fraas, of Stuttgart, to the *Fundberichte aus Schwaben* for 1899, vol. vii. p. 39, their sculptors expressed this distinction by modelling statuettes of both species. Three of these statuettes were dug up in Swabia in a railway cutting embedded in clay at a considerable depth, in association with the remains of the mammoth and other extinct animals; but it is quite clear that they must have been artificially introduced into this stratum.

Reverting to Cæsar's account, it is a matter for regret that the colour of the aurochs is referred to as being like that of domesticated cattle. Since, however, as is shown later, we have evidence that the aurochs was black in Poland, but possibly red in Germany, it will be obvious that the comparison was not made with imported pale-coloured cattle from the Roman Campagna, but, most probably, with a native dark-coloured breed. The importance of this will be noticed in the sequel.

It will further be noticed that the aurochs evidently differed from the bison by its smoother coat, by the much greater spread of its horns, and apparently also by its superior stature, strength, and speed. The large size of the horns is abundantly confirmed by that of the bony horn-cores of fossil skulls, as well as by a few specimens of the horns themselves, either dug up from the peat, or preserved to a late date as drinking-vessels in churches and castles.

It does not appear that Cæsar ever saw a living wild aurochs, his account having been derived from native German hunters, who were well acquainted with the animal. On the other hand, it is probable that he had seen and drunk from its horns, which were at an early date mounted in silver as goblets, and were supposed to bring good luck to those who drank from them.

In the year 530 the poet Fortunatus mentions that one Gogon had hunted *bubali* (literally buffaloes) in the Wasgenwald; but there is little doubt that the animals referred to were in reality aurochs, as the author states in a later passage that his *bubalus* is the same animal as the Germans

call ur.¹ Reference is also made by Gregorius, Bishop of Tours, in the year 573 to the unlawful slaughter of a so-called *bubalus* in the Wasgenwald, the killing of such animals being prohibited. Carl the Great is also stated to have hunted wild bulls, although no further particulars are given.

Old chronicles mention that in the middle of the sixth century wild bulls were found, although rarely, in the province of Maine, in France; and during the ninth century Charlemagne hunted aurochs in the great forests near Aix-la-Chapelle, while at the close of the following century the flesh of these animals is alluded to in the rolls of an abbey in Switzerland as an article of food. The aurochs was met with during the route taken through Germany by the first crusade, in the eleventh century; and that it still lingered in the neighbourhood of Worms during the twelfth century is indicated by the above-mentioned slaughter of four individuals by Siegfried, recorded in the "Niebelungenlied," which was published in the year 1200.

About the same period, that is to say in the year 1170, we find Hartmann von Aue alluding to the occurrence of both aurochs and bison in the forests of the Rhine district, where they were from time to time hunted by the kings and nobles.² The trophies obtained during these hunts were carefully preserved, and there is the testimony of Conrad Gesner, the great naturalist of the sixteenth century, to the effect that he had seen in the treasuries at Worms

¹ As noticed in the ninth chapter, the word *bubalus* was probably applied in Italy to buffaloes during the seventh century.

² See A. Mertens, *Abhandlungen und Berichte Museum für Nature—und Heimatkunde zu Magdeburg*, vol. i. p. 60, 1906.

and Mayence skulls of the aurochs with horns of immense size. We are told, again, that in the second half of the sixteenth century Bishop Johann von Manderscheid discovered in his episcopal treasury a huge horn mounted as a goblet, which from its great size could only have belonged to an aurochs. This horn was deposited by the bishop in the castle of Hohenbarr, near Zabern, as the emblem of a body known as the "Bruderschaft des Hornes" (Confraternity of the Horn), whose object was to bring together the hardest drinkers in the district. What became of this trophy is unknown; and the same is the case with other aurochs-horns mounted as drinking-cups and preserved in many inns, churches, and castles, especially in South Germany and Alsace-Lorraine, till a comparatively recent date, one of which measured $6\frac{1}{2}$ feet in length, while another held $3\frac{1}{2}$ quarts.

There are likewise certain references to the aurochs and the bison, as animals then living in Europe, between the years 1240 and 1364; but much more important information is afforded with regard to the existence of the former species in eastern Prussia and Lithuania (the modern Grodno) at the close of the fourteenth century. There occur, for instance, in a kind of an account-book ("Das Marienburger Tresslerbuch der Jahre, 1399-1409") various entries under the headings of Euwir, Uwer, Weszent, Wesent, and Wesant, of which the last three refer to the bison, and the other two to the aurochs, the bison being more frequently mentioned than the aurochs. Thus in an entry dated 2nd February 1404 it is stated that one mark and a half was given to a Prussian who brought an aurochs;

while another entry relates to a reward paid to two Prussians for a second aurochs. Whether these animals were brought alive or dead is not stated; but it is quite evident that the species was at this time living in the forests around Marienburg.¹ A third entry, dated 7th April 1400, mentions one mark (equivalent to about thirteen shillings in modern money) being paid to a Lithuanian for bringing four aurochs from Duke Witowt, of Lithuania. That these must have been young animals is certain, and it is also probable that they were tamed. They were brought with the request that they should be forwarded to Dantzic, and thence by sea to Burgundy; and there are items recording the amounts paid for freight, fodder, attendance, etc., all of which go to prove that aurochs were then regarded as valuable animals.

All this indicates that aurochs were still living in Prussia and Lithuania in 1400, and probably at least as late as 1409, although in Prussia, at any rate, they were becoming scarce. By 1400, or thereabouts, the species had, however, been exterminated in western Europe, and especially Germany, as there is no reference to its existence in literature, and its name soon became confounded with that of the bison. In fact, all tradition of its former existence in this part of the Continent seemed to have been completely lost. As it was a forest-dwelling species, the destruction of the forests, which had by this time taken place, is alone sufficient to account for its extinction. For as the forests were felled and cleared, and their sites converted into cultivated ground, the aurochs would be driven into more and

¹ See Mertens, *op. cit.* pp. 62, 63.

more remote districts, while even there the half-wild domesticated cattle would consume much of the grass which formed their food. Hunting, too, doubtless did its share in the extermination of the aurochs, and in the driving back of the range of the bison to Lithuania and the Caucasus.

As to the date when the aurochs disappeared from eastern Prussia and Lithuania there appears to be no clue; but it is practically certain that sometime after 1409, or thereabouts, the wild ox survived only in the fastnesses of Poland, at any rate so far as Europe is concerned.¹ Here, as previously mentioned, it was known by the name of *tur* or *thur*, while the bison was, and still is, termed the *zubr* or *suber*. One of the earliest records of the existence of the aurochs in Poland is a proclamation by Duke Boleslaus of Masovia, dated 1298, in which the hunting of the *tur* is prohibited for the future. In a second ancient document, dated 1359, Duke Ziemovit of Masovia grants permission to the Duchess of Wyszogród to hunt all animals on his estates with the exception of *tur*.

In both the above instances Masovia, or that portion of Poland situated in the west of the old kingdom, near the present German frontier, is given as the home of the wild ox. Here it survived longest, probably in much the same manner as the bison does in the Lithuanian forest of Bielowitza (pronounced Bielowish), namely, under the special protection of the Polish nobles. At that time the portion of Masovia lying about $33\frac{1}{2}$ miles (55 kilometres) to the west-south-west of Warsaw, between the parishes of

¹ No importance can apparently be attached to certain alleged evidence of the aurochs being hunted in Bavaria in 1596.

Bolemow, Wiskitki, and Mszczew, and northwards nearly to Sochaczew, was covered with a great forest, known either, from the village Jaktorow, as the Jaktorowka forest, or, from the neighbouring district of Wiskitki, as the Wiskitki forest. In the description of Masovia by Andreas Swiecicki, published at Warsaw in 1634, it is, however, referred to as *Hectorea Silva* (the Hectorean forest). It has now completely disappeared. This forest was the last refuge of the aurochs. It was visited by Swiecicki, who was notary of the district of Narew, in Masovia; but he speaks only of bison, and these from another and distant forest, the Skwa forest, so named from the river Skwa, which lies between the rivers Pysz and Omulew, northwards of Narew.

Fortunately a full account of the tur in the Jaktorowka forest has been preserved to us in the writings of Count, or Baron, Sigismund von Herberstein or Herberstain (the name is spelt in both ways), who was a German diplomatist and historian, born at Wippach in 1486, and who died at Vienna in 1566. As an envoy from Kaiser Maximilian and his successors, Kaiser Carl v and King Ferdinand, he had occasion to pay several visits to Russia and Poland.

His first visit to Poland, to King Sigismund I, who at that time dwelt at Wilna, was undertaken from Moscow, in company with Count Wassilij Iwanow, during the years 1516, 1517, and 1518; while the second, also from Moscow, occurred in the years 1520 and 1527. In 1542 he again had occasion to visit Cracow in connection with the marriage of the Princess Elizabeth, the daughter of his sovereign, with Sigismund August, the Crown Prince of Poland;

and in the following year he accompanied the princess on her bridal journey to her new home. Finally, in 1545, he brought the young queen her dowry. During these journeys Herberstein passed through a great part of Poland, and enjoyed full opportunities of studying the country and its people.

After these journeys Herberstein occupied himself with writing up his experiences and an account of Poland, Lithuania, and Russia generally. His work was published anonymously in the year 1549, under the title *Rerum Moscovitaricum Commentarii*, with many illustrations. The work, which subsequently was republished with the author's name, went through a number of editions, and was translated into various languages, with some modification of the title; a circumstance which has given rise to much confusion with regard to its real date. An Italian edition was, for instance, published by G. B. Pedrezzano at Venice in 1550. Another edition appeared in 1552, a third in 1556, and a fourth in 1557, while there were also others, the 1557 edition published at Antwerp¹ being said to be the best, and containing a fuller account of the aurochs than is found in the earlier issues. The later editions also contain figures of the aurochs and the bison, these figures differing in size and in certain slight details in some of the editions.

In addition to giving a detailed account of the bison in Lithuania, Herberstein states that in his time the aurochs was restricted to Masovia, mention-

¹ Herberstein (S. von), Baron. *Rerum Moscoviticarum Commentarij*, Sigismundo Libero authore. Russiæ brevissima descriptio, & de religione eorum varia inserta sunt. Chorographia totius imperij Moscici, & vicinorum quorundam mentio. 8vo, Rom. type, with Ital. passages.—*Ioan. Latius for Ioa. Stelsius, Antwerp, 1557.*

ing that it resembled black domesticated cattle, and also that the horns differed in colour from those of the bison.

After the appearance of the anonymous first edition of the *Commentarii* it would seem that Herberstein again visited Poland, where he had business with King Sigismund August and the Queen-Mother Bona. At the conclusion of the negotiations the king presented him with the eviscerated carcase of an aurochs, lacking the skin of the forehead, while the queen-mother gave him two girdles of tur-hide, which were regarded as of great rarity and value. These presents Herberstein took with him on his return to Vienna, keeping one of the girdles himself, and presenting the other to the consort of King Ferdinand. The hide, together with that of a bison which he had brought home from Poland on a previous occasion, he had stuffed; and the two specimens were eventually placed on exhibition in his house at Vienna. Testimony to this effect is afforded in a Latin poem of Caspar Betius Transsylvanicus, written in the year 1552, and published in Vienna in 1558.¹ According to this poem, the two specimens were mounted in the entrance hall of Herberstein's residence in such a manner as to show not only the body in connection with the limbs and the horns, but also that the aurochs had the broader chest and the bison the longer limbs. Such details, it has been pointed out by Dr. Nehring, could not have been made manifest if the dried and flattened skins were hung up, and it may accordingly be taken that they were mounted after the rude fashion of those days.

¹ The original poem is quoted by Mertens, *op. cit.* p. 68.



FIG. I. HERBERSTEIN'S AUROCHS



FIG. 2. THE AUGSBURG AUROCHS

Considerable discussion has taken place as to whether Herberstein ever saw a living aurochs, Dr. Nehring¹ being of opinion that he did so during his visit to Poland in 1550. From the 8th till 13th July of that year Herberstein appears to have been alone at Gomolia, and Dr. Nehring thought it probable that during this interval he made a trip to the Jaktorowka forest to see the tur. Whether he really did so must, however, remain a matter of doubt; although Conrad Gesner in the appendix to the second volume of his *Historia Animalium*, published at Zurich in 1554, states that Wolfgang Lazius, the publisher of an edition of the *Commentarii* at Basle, assured him that the pictures of the aurochs and bison in that work were drawn from life. Dr. Nehring has, however, pointed out that there would be considerable difficulty in sketching an aurochs in the Jaktorowka forest, especially if Herberstein himself was not an artist. Moreover, Professor T. Noak,² from a study of the engravings themselves, has come to the conclusion that they were drawn from the stuffed skins in Herberstein's residence at Vienna. He observes, for instance, that there are certain lines in the figure of the bison indicating the existence of cuts in the skin of the hind-quarters and hind-legs, while a piece (as was the practice at that time when animals of the chase were killed) appears to have been cut out of the shoulder of the aurochs. Again, in the bison the wooden beam or plank upon which the head was mounted seems to have been inclined at much too high an angle, thus abnormally increasing

¹ *Über Herberstein und Hirsfogel*, Berlin, 1897, p. 13.

² "Die Herbersteinschen Abbildungen des Ur und des Bison," *Landwirtschaftliche Jahrbücher*, Berlin, 1896, p. 921.

the depth of the body, and at the same time causing the front and hind limbs to be a great deal too close together. The beard, too, is quite unlike that of a living bison, thus affording further evidence in favour of the figure having been drawn from a stuffed specimen. Then, again, the heads of both animals apparently indicate that in each case the skull without the lower jaw had been sewn in the wet skin, thus giving rise to that "underhung" appearance which is speedily noticeable in the case of the bison. There is likewise a crack in the skin between the horns, which is alone practically sufficient to prove that the figure of the bison was taken from a stuffed specimen. In the case of the aurochs, in addition to the piece inserted in the shoulder, the chief defect is the incorrect curvature of the horns, as compared with those in an old representation of the aurochs from Vaphio and those of fossil skulls, to say nothing of those of allied breeds of domesticated oxen. Whether this incorrect curvature be due to bad drawing or to bad mounting is not easy to say, although the existence of a similar error in the case of the bison is in favour of the former alternative.

The horns of the aurochs are, however, represented in Herberstein's figure as being wholly black, whereas it is known from the evidence of a fossil horn discovered some years ago in the peat of Pomerania that, as in the Chillingham, Pembroke, and Spanish cattle, they were really "horn-coloured" with black tips. Both pictures accordingly seem to show the animals, not as in life, but as they were mounted in Herberstein's collection. The portrait of the aurochs is extremely valuable, more especially the one (herewith repro-

duced) in the German edition of Herberstein's work published in 1557 and commonly referred to as the *Moskovia*.

Pictures of both the aurochs and the bison also occur in a map of the world published at Ebstorf towards the close of the thirteenth century, and therefore long antedating Herberstein's work. This map, which appears to be preserved in Hanover, contains coloured figures of several kinds of animals, as well as of men. It has been stated to be the work of a monk named Helmot; but according to Dr. Hilzheimer,¹ the most recent writer on the subject, its author is unknown. In this map, as illustrative of Russia ("Rucia"), is represented a tawny-red ox, with long upright and inwardly-curved horns, which bears the inscription "Urus." In another illustration, explanatory of the products of Asia Minor, is an unmistakable portrait of the bison, bearing the inscription "Bonacus" (= Bonasus).

Dr. Mertens, in the paper already quoted, has accepted this map as evidence that the aurochs was living in Germany at the end of the thirteenth century, and likewise that in this part of Europe its colour was red. Dr. Hilzheimer, on the other hand, believes the figures of the animals to have been copied from earlier writers or cartographers, and is of opinion that the colour of the aurochs cannot be regarded as true to nature, pointing out, among other objections, that the colour of the pigment may have changed with time. In his opinion, the picture is of no value, either as evidence of the existence of the aurochs in Germany at the end of the thirteenth century, or

¹ "Wie hat der Ur ausgesehen?" *Jahrbuch für wiss. u. prakt. Tierzucht*, vol. v. p. 74, 1910.

as to the colour of the local representative of the animal.

A third picture of the aurochs was introduced by Colonel Hamilton Smith in Edward Griffiths' English edition of Cuvier's *Règne Animal*, published in London in 1827 under the title of *The Animal Kingdom*. The original picture from which the engraving was made was copied from an oil-painting on wood purchased by Hamilton Smith from a dealer in Augsburg, and hence known as the Augsburg portrait.¹ This picture, which now appears to be lost, is believed to date from the first quarter of the sixteenth century, or a little earlier than Herberstein's first visit to Poland; and there can be no doubt that it really represents an aurochs, this being confirmed by Hamilton Smith's description of the picture, given in vol. iv. p. 415 of *The Animal Kingdom*, which runs as follows: "It is a profile portrait of a bull without mane, but rather rugged, with a large head, thick neck, small dewlap, entirely sooty black, the chin alone white, and the horns turning forward and then upward like the bull of Romania, pale in colour with black tips. In the corner were the remains of armorial bearings and the word Thur in golden German characters nearly effaced."

This inscription renders it practically certain that the picture was taken from a Polish tur, or wild bull, although the opinion has been expressed that it was painted from a stuffed specimen, and not from a wild animal. With the exception of the parti-coloured horns and the absence of a light streak down the back (which might, however, have been

¹ See Mertens, *op. cit.* p. 102.

invisible in the position from which the picture was painted), the colour agrees precisely with Herberstein's description mentioned later on, and thereby renders it indisputable that adult Polish wild bulls were black.

Colonel Hamilton Smith adds that the Augsburg picture agrees with a sculpture on the "stone of Clunia," which has a Celto-Iberian inscription, and represents a hunter facing a wild bull.

In addition to that of Herberstein, contemporary accounts of Polish aurochs have come down to us in the writings of Conrad Gesner¹ derived from his friends Baron Bonarus and Dr. Schneeberger, the latter of whom was a physician resident in Cracow during part of the sixteenth century.

From these accounts it appears that the breeding season of the aurochs occurred in September, and that the calves were born in the following May. Bull calves were at first blackish brown, but afterwards became black, with a light streak along the spine. It is also stated by Baron Bonarus that the bulls frequently paired with domesticated cows, the latter being very similar in colour to their wild relatives; while, on the other hand, it is expressly mentioned that no such intercourse took place between the wild bison and domesticated cattle.

The difference in the colour of the young and the adults is paralleled in the case of the Javan bantin (*Bos sondaicus*), where only the adult bulls are black.

The accounts of the aurochs do not, however, end with those of Herberstein, Bonarus, and Schneeberger, for in 1596 Cardinal Gaetano was dispatched by

¹ *Historia Animalium*, ed. 1606, pp. 141, 142.

Pope Clement VII on a mission to Poland, accompanied by his private secretary, Paul Mucante, who left a diary, in which it is stated that the King of Poland presented the cardinal with the carcase of an aurochs from a royal preserve. This aurochs was grey, and its flesh, when eaten, was pronounced to be very like ordinary beef, but drier and tougher. Subsequently the cardinal paid a visit to the preserve, which was a huge enclosed forest about two miles from Warsaw, where various wild animals were kept; but although bison were seen, no aurochs made its appearance. In the diary distinction is drawn between aurochs, domesticated cattle, and bison.

This account is of importance, as indicating that the Polish sovereign possessed a private preserve, apart from the Jaktorowka Forest,¹ where both aurochs and bison were kept. Mucante further states that aurochs were still living in the Jaktorowka Forest, and that they were in much the same condition as the bison at the present day in Bielowitza, having to be supplied by their keepers in winter with fodder.

As regards the ultimate fate of the Jaktorowka aurochs, it appears from contemporary documents quoted by Jarocki² that in the year 1564 the herd still comprised thirty head, namely, twenty-two cows, three steers, and five calves, in addition to eight solitary bulls. By 1599 the number had, however, become reduced to twenty-four, and by 1602 to four,

¹ In Harmsworth's *Natural History*, vol. i. p. 622, I have unfortunately confounded the two.

² *Pisma Rozmaite*, vol. ii. p. 279; see also Pusch, *Polens Palæontologie*, Stuttgart, 1837, p. 200.

while in 1620 the sole survivor was a cow, which, according to the report of 1630, died in 1627. With the death of this cow the aurochs, as a wild animal, apparently ceased to exist.¹

There appears, however, to have been still a certain number of half-wild aurochs existing in enclosed parks or menageries, of which the most celebrated was that of Zamosc, in Poland. Testimony to this effect occurs in a letter from Lemberg, written by Count Johann von Ostrorog in 1610, and it is probable, although not certain, that some of these aurochs were living at least in 1627.

In summing up the general appearance of the aurochs in the 1557 Antwerp edition of his work, Herberstein observed that the adult aurochs was very like domesticated cattle, but that all were blackish, with in some cases at any rate a light line, formed by an admixture of white hairs down the back. This is confirmed, with the exception of the light line, by the Augsburg picture. The accounts of Bonarus and Schneeberger refer, however, only to the adult bulls being black, with a white dorsal line; and it is quite probable that the cows, like the bull-calves, were lighter in colour—in fact, brown instead of blackish brown. Both the latter writers refer to the forward direction of the horns, which is also shown in the Augsburg portrait. On the other hand, Mucante describes the aurochs given to Cardinal Gaetano as grey; but this, as suggested below, may have been an abnormality.

¹ Mr. Hedger Wallace, *Trans. Nat. Hist. Soc. Glasgow*, ser. ii. vol. v. p. 239, states that this aurochs was a tame one in the preserve of Count Samoiskey, at Saklorowa, but this is not borne out by Dr. Mertens, *op. cit.*, who distinctly states, on the authority of Jarocki, that it was a wild animal from the Jaktorowka herd.

From the reddish yellow (sienna) colour of the picture on the Ebstorf map, Dr. Mertens has suggested that there may have been a red race of the aurochs in Germany; but, as stated above, Dr. Hilzheimer regards the colouring of the picture as untrustworthy. Dr. Mertens¹ has also described a fragment of skin with the hair attached on an aurochs' skull in the museum at Magdeburg, obtained at Shönebeck, as showing long reddish hairs at the back of the base of the horns, and of shorter whitish ones in front. And from this he infers that the general colour of the animal was red, perhaps with patches of a paler tint, although this is doubtful, as light hairs are often found at the base of the horns in ruminants which are otherwise red or dark-coloured. Dr. Mertens regarded this as further evidence in favour of the existence of a red aurochs in Germany; but if the colour in the Ebstorf map be untrustworthy, the value of the evidence of the Schönebeck skull is considerably discounted. Still, there is no reason why there should not have been local races of the aurochs; and Cæsar's statement that the Hercynian aurochs was similar in colour to "our cattle" (*nostræ boves*) may possibly be an indication that the former was a red and not a black animal.

Be this as it may, the possibility of the existence of a red as well as a black race of the aurochs is countenanced by the case of the existing bantin of the Malay countries, in the typical Javan race of which, as mentioned above, the old bulls, apart from a white rump-patch and legs, are black, while younger bulls and cows at all ages are red. In Burma, however, there is a pale-coloured race (*B. sondaicus*

¹ *Op. cit.* p. 94.

birmanicus), in which the adult bulls are normally tawny or pale chestnut.

On the other hand, it is not improbable that some of the last survivors of the aurochs, more especially those kept in enclosed parks, may have shown a tendency to depart from the normal type of colour, especially if they had any strain of domesticated blood; and this may have been the case with the grey aurochs presented to Cardinal Gaetano, which, it should be noted, came from the royal preserve near Warsaw, and not from the Jaktorowka Forest, three-and-thirty miles distant.

Much has been made of an illustration in some of the editions of Ulrich von Richental's *Chronik des Konstanzer Konsils*, of which the text seems to have been first published in 1420, although the illustrated editions did not appear till 1433, 1463, and 1483. The illustration, which is reproduced in page 69 of Dr. Hilzheimer's article entitled "Wie had der Ur ausgesehen?"¹ shows two Polish peasants unloading a four-wheeled cart which they had brought from Cracow to Constance. The contents of the cart include two barrels and the carcase of a brownish black steer. From the text we learn that the King of Poland sent to the Latin King of Constance a huge aurochs, or tur, which had been captured in Lithuania. Originally three were caught, but two appear to have died on the way to Cracow, and their flesh was preserved in the aforesaid barrels, one of which seems to have been subsequently forwarded to the King of England. Judging from the illustration, it would seem that the aurochs brought to Cracow did not reach Constance alive.

¹ *Jahrbuch für wiss. u. prakt. Tierzucht*, vol. v. 1910.

That the steer shown in the illustration is intended to represent an aurochs may be considered certain; but, seeing that it does not apparently occur in the original edition, there may be a doubt as to whether it was drawn from the actual specimen. From this illustration Dr. L. Adametz¹ has, however, suggested that the animal depicted represents a small, short-horned race of the aurochs, which was the ancestral type of the so-called Celtic shorthorn, to which fuller reference is made in the next chapter. Herberstein's account indicates, however, that the Polish aurochs was a huge beast; and it is practically certain that there would not be two races of the species inhabiting the same area. Moreover, as Dr. Hilzheimer has pointed out, the horns of the dead animal indicate an immature animal; and, whether or no the picture was drawn direct from the actual specimen, it seems most probable that the three aurochs captured by the order of the Polish king were young steers, since it would have been a very difficult task at that date to capture and bring to Cracow three adult bulls.

Finally, reference may be made to an account of an aurochs-hunt by Gedymin, Duke of Lithuania, in the year 1320, near Swintoroh, in which an adult bull was killed, which will be found in C. Würzback's *Die Sprichtwörter der Polen*, Vienna, 1852, 2nd ed.² The horns of this animal were in existence as drinking-vessels in 1429.

¹ "Studien über *Bos (brachyceros) europæus*, die wilde Stammform der Brachyceros - Rassen des europäischen Hausrindes," *Journ. für Landwirtschaft*, 1889, p. 269, and "Über das in der Ulrich von Richentalschen Chronik befindliche Bildnis des Auerochsen," *Zeits. f. landwirtschaft. Versuchswesen in Österreich*, 1908, 3 pp.

² *Vide Hilzheimer, op. cit.* p. 74.

Apart from its greatly superior size, heavy mane, throat-fringe, and the light line along the back, the Polish aurochs would seem to have approximated in general appearance to the modern black Pembroke cattle, which are known to be an ancient breed, and carry forwardly-directed horns, black at and near the tips, but elsewhere whitish horn-colour. The colour of the hair was, however, in the opinion of Dr. Hilzheimer, blackish brown rather than jet black.

Reverting to Græco-Roman times, it has to be mentioned that the accounts of conflicts with gigantic oxen to be met with in classical literature doubtless refer to the aurochs, and thus confirm the evidence afforded by skulls of the former existence of the species in Italy, and likewise indicate that its range also extended into Greece.

In this connection reference may be made to a very beautiful coloured mosaic pavement from a Roman villa brought to England about the year 1780, and now forming part of the floor of the sculpture-gallery at the Duke of Bedford's seat at Woburn. The central panel of this pavement represents a group of animals in colours, namely, a bull on the left, a tiger on the right, a serpent in the middle, and above them a couple of red-legged partridges, the last, with the exception of the legs, being coloured fairly true to nature. From its massive build, and close resemblance in general form to the Roman statuettes referred to above,¹ there seems every reason to believe that the bull depicted in this pavement represents a wild aurochs, although the horns are relatively short. If this be so, it is

¹ *Supra*, p. 38.

interesting to note that the colour of the animal is dark slaty grey. The value of this is, however, considerably discounted by the fact that the tiger on the right side of the panel is coloured of a nearly similar tint; possibly, however, this may have been done to make the colouring of the two sides of the picture accord.

Returning to classic literature, evidence has been brought forward by Dr. C. Keller,¹ of Zurich, to show that the famous legend of the Cretan minotaur is founded on the aurochs. In a corner of the so-called throne-room of the palace of King Minos, at Knossus, in Crete, Dr. Keller discovered part of a skull and numerous horn-cores of oxen, which from their large size are referred to the aurochs. The skull shows unmistakable signs of burning. These relics, together with others from localities in the neighbourhood all belonging to the Minos period, have been deposited in the museum at Candia. In addition to these bones, evidence of the former existence of the aurochs in Crete is afforded by the discovery of sketches of that animal, estimated to date from about 2000 B.C. There is also the head of a bull modelled in black steatite, which is stated to be a truthful, although rude, portrait of the aurochs; and of still more importance is a marble bas-relief depicting in a lifelike manner the same animal in its entirety. In the palace of King Minos there is also a painting of the aurochs, in which the characteristic form of the horns is unmistakable; and it is interesting to note that, while the head and body of the animal are shown as sepia-brown in colour, the horns are nearly

¹ "Die ausgestorbene Fauna von Kreta," *Vierteljahrsche Nat. Ges. Zurich*, vol. liv. pp. 424-435, 1909.

white. In these respects the painting of the Cretan artist accords closely with the description of the aurochs given by Herberstein. Dr. Keller also records numerous other representations of the ancient wild bull of Crete, to which fuller reference is here unnecessary. Archæologists have already explained the legend of the Argonauts and the golden fleece by the discovery that in ancient times the sheep of Colchis were famed for their long and fine wool, and were accordingly imported into Greece to improve the native breed, and Dr. Keller claims that his discoveries in Crete serve to throw light on the myth of Theseus and the minotaur, that is to say, the bull of King Minos (*Minos taurus*). He has proved that about the year 2000 B.C., or somewhat later, wild bulls inhabited the forests of Crete, and that some of these were brought into the palace of King Minos at Knossus. That palace was destroyed by fire, so that the burnt condition of the aurochs' skull above referred to may have been caused by that conflagration. Apart from this, archæological evidence has demonstrated that the so-called labyrinth in which the minotaur dwelt was the palace of King Minos; and Dr. Keller suggests that young wild bulls were caught and brought here to be partially tamed and then used in the arena. The annual tribute of youths and maidens demanded from Athens for the minotaur he explains by suggesting that these were given as slaves to the best bull-fighters. Now and then a bull may have become unmanageable, and hence the need for a hero like Theseus, with Ariadne as his guide, to penetrate the recesses of the labyrinth and slay the monster. That such a monster should combine the head of a bull with the body of a

man is in accordance with Greek poetic licence and fancy.

During Biblical times the range of the aurochs extended into Syria; the Hebrew word *rěēm*, or *rěēym*, translated in the Authorised Version of the Bible as unicorn, apparently indicating that animal. That the *rěēm*, as I have written in Murray's *Dictionary of the Bible*, was not a one-horned animal (whatever the mythical "unicorn" may have been) is evident from Deuteronomy, chap. xxxiii. v. 17, where, in the blessing of Joseph, it is stated, "His glory is like the firstling of his bullock, and his horns are like the horns of *an unicorn*," not, as the text of the Authorised Version renders it, "the horns of *unicorns*." The two horns of the *rěēm* are "the ten thousands of Ephraim and the thousands of Manasseh." Some difficulty arises from the fact that *rīm* or *rhīm* is the Arabic name of Loder's gazelle (*Gazella leptoceros*) of North Africa. Canon Tristram indeed suggested that this name may have been transferred to the gazelles (and perhaps other antelopes) after the extermination of the wild ox, but this seems improbable. The idea that the buffalo is intended is very unlikely, seeing that this animal only exists in a domesticated state in Palestine, where it appears to have been introduced at a comparatively late epoch. Little can be urged in favour of the African two-horned rhinoceros, for that animal does not exist in Syria, and even if it had been a native it would have been forbidden to be sacrificed by the law of Moses, whereas the *rěēm* is mentioned by Isaiah as coming down with bullocks and rams to the Lord's sacrifice. Again, the skipping of young *rěēm* (Psalm xxix. v. 6) is incompatible with the

habits of a rhinoceros. With regard to the claims of any member of the antelope group, it may be observed that all the Syrian species are harmless unless wounded or hard pressed by hunters, nor do they possess extraordinary strength. Considering, then, that the *rĕēm* is described as a two-horned animal of great strength and ferocity, that it was evidently well known and often seen by the Jews, that it is mentioned as an animal fit for sacrificial purposes, and that it is frequently associated with bulls and oxen, the inference is that a wild member of the same group is referred to. Moreover, the allusion in Psalm xcii. v. 10, "But thou shalt lift up, as a *rĕĕym*, my horn," seems to point to the mode in which oxen use their horns, lowering the head and then tossing it up. If this inference, which is very generally accepted,¹ be true, the aurochs is doubtless the animal indicated by *rĕēm*. Moreover, representations of the aurochs undoubtedly occur in some of the sculptures discovered by Sir H. Layard at Nineveh; and an obelisk of Tiglath-Pileser's time (1120-1110 B.C.) depicts a young aurochs under the name of *rĕmi*.² This last instance seems to settle the question as to the identity of the *rĕēm* with the aurochs.

It may be added that in the opinion of Dr. Dürst the Biblical phrase, "bulls of Basan," likewise refers to the wild bull.

Some of the most striking representations of the aurochs are to be found among the sculptures of the palaces of the Assyrian kings, more especially

¹ See J. U. Dürst, *Die Rinder von Babylonien, Assyrien, and Ägypten*, Berlin, 1899.

² *Ibid.* p. 10.

Assurnassirpal. In one of these, which is described and figured by Dr. Dürst,¹ the king is shown standing up in a car drawn by three horses abreast, which are at the gallop. Over the axle of the right chariot-wheel are the fore-legs of a galloping aurochs, which the king has seized in his left hand by the right horn and is about to decapitate with a sword held in his right. Beneath the horses lies a second aurochs, which has been stricken down by arrows. Armed horsemen gallop behind the chariot in case of assistance being required.

In a later work (R. Pumpelly's *Explorations in Turkestan*, Washington, 1908, vol. ii. p. 361), Dr. Dürst identifies the aurochs of the Assyrian and Babylonian sculptures with the extinct Narbada ox (*B. namadicus*) of the Pleistocene of central India, which he terms the Asiatic aurochs; while he likewise refers to the same species certain imperfect bovine remains from the Prehistoric deposits of Turkestan. The Narbada ox is, however, probably related to the bantin and gaur of south-eastern Asia, a skull of the former, described by Professor Rütimeyer under the name of *B. palæogaurus*, being essentially of the bantin and gaur type, as has been already pointed out by Professor J. C. Ewart. The Narbada ox, or a closely allied species, may, in fact, have been the ultimate ancestor of the zebu, and thus of the ancient Egyptian and modern Hungarian long-horned cattle. Such an ancestry is indeed claimed for the two latter by Dr. Dürst, who includes in the same group a skull of the Hissar humped ox (*op. cit.* pl. lxxxii. fig. 1) without apparently recognising that it is a zebu. If the descent of the zebu from the Narbada

¹ *Op. cit.* p. 9, pl. i. fig. 2.

ox be eventually established, the name *B. indicus*, as being much the earliest, will have to stand for the species.

The remains from Turkestan appear too imperfect to admit of definite specific determination.

Another Assyrian fresco described by Sir H. Layard, whose figure is reproduced on page 83 of Dr. Hilzheimer's oft-quoted article entitled "Wie hat der Ur ausgesehen?" shows a king and his attendant galloping alongside an aurochs bull, which exhibits signs of being nearly exhausted. The animal is depicted with a heavy mane and a throat-fringe, its tail reaching somewhat below the hocks. The forward direction of the horns is well shown, although their curvature is made too like those of agnu.

The bull shown in the accompanying text-figure¹—of which the central part represents the sacred Assyrian symbolic tree—appears to be likewise an aurochs, although no mane is shown, and the tail, which is heavily tufted, reaches to the fetlocks. The animal is quite unlike the figure of the ancient Assyrian humped ox reproduced later on in the present volume, and in general contour agrees with the figure forming the second illustration on page 83 of Dr. Hilzheimer's paper. This figure of, presumably, an aurochs bull is from the tomb of Istartor, in Babylon. In this instance a mane is depicted, and the tail is as long as in the figure here reproduced, reaching to the fetlocks, and having a large terminal tuft. The limbs are relatively long and

¹ This sculpture is known as Lord Aberdeen's Black Stone; the original figure occurs on p. 298 of Fergusson's *Nineveh and Persepolis*.

slender, and their proportions are regarded by Dr. Hilzheimer as approximately true to nature, although this may be doubtful, since they appear stouter and shorter in the figure here reproduced.

Going back to prehistoric times (by which, it may be well to mention, is meant the period immediately preceding the historical, and not any of the antecedent geological epochs), it is curious to find that no sculptured or pictorial representations of the aurochs



AN ASSYRIAN REPRESENTATION OF THE AUROCHS

have been discovered among the remains of the early Stone Age. There is, however, a rude painting on the walls of the cavern of Combarelles. Apart from this, evidence is afforded that the aurochs was hunted and killed by the hunters of those days by the circumstance that skulls have been found both in England and Denmark with flint axe-heads or spear-heads embedded in the forehead. A whole skeleton from the English fens, in which the forehead is thus pierced, is exhibited in the University Zoological Museum at Cambridge; and another skeleton from Denmark, exhibiting the marks of

flint-implements on the ribs, is described and figured by Messrs. N. Hartz and H. Winge.¹

When the wild ox disappeared from Britain is unknown; but the skulls and bones from the English fens and the Scottish peat-bogs indicate an animal little, if at all, superior in size to the Polish aurochs. When, however, a lower geological horizon is reached, namely, that of the brick-earth at Ilford in Essex, skulls and bones of much larger size are obtained, which must have belonged to really gigantic animals, although from the more forward direction of their horn-cores their span is less than in smaller specimens from the peat-bogs and fens. In a skull of the latter type from Atholl, preserved in the British Museum, the bony horn-cores have a span of 42 inches from tip to tip, and when these were covered with the horny sheaths the span was probably at least as much as 50 inches.

If, as is probable, the huge skulls from Ilford—of which a magnificent series, collected by the late Sir Antonio Brady, is exhibited in the Natural History branch of the British Museum—are entitled to rank as a distinct race, it should bear the name of *B. taurus giganteus*.

Skulls and other bones of the aurochs have been obtained, as already mentioned, from England and Scotland, but are apparently unknown in Ireland. On the Continent they occur in Denmark, France, Switzerland, Italy, Scandinavia, Germany, and Austria; while it may be taken as certain that the species roamed over Russia, although its exact eastern and northern limits are not ascertained.

¹ *Aarboger for Norish Oldkyndiged og Historie*, Copenhagen, 1906, p. 233.

Southwards the aurochs ranged as far as Crete and Algeria ; its Algerian representative has been described as a separate race under the name of *B. taurus mauretanicus*. Skulls and other remains of an extinct wild ox (*B. namadicus*), apparently nearly related to the aurochs and of huge size, have been obtained from the gravels of the Narbada valley, in central India. In the typical form of this Narbada wild ox the bony cores of the horns were cylindrical, as in the aurochs, and likewise with a marked forward direction, but in some specimens they are more or less elliptical in section, thereby showing an approximation to the existing Indian wild ox, or gaur (*B. gaurus*).

As regards the habits of the aurochs, these can in the main be inferred only from those of British park-cattle, forming the subject of the next chapter, and of the European domesticated breeds, most of which are probably derivatives of the old wild ox. From Cæsar's account, and likewise from casual remarks of later historians, the aurochs, and, no doubt, the bull in particular, was a ferocious animal, ready to charge at a moment's notice, and endowed with great speed. The old bulls, except during the pairing season, were doubtless solitary ; and as all cattle are mainly grazers, it is probable that both the solitary bulls and the herds frequented the more open parts of the forests, where there was abundance of grass in the glades. Bulls may be presumed to have possessed the roaring bellow characteristic of their European domesticated descendants, while the cows lowed in the fashion of those of the modern breeds. Both sexes may be inferred to have been in the habit of standing knee-deep in water for hours at a time in

hot weather in order to escape in some degree from the torments of flies ; and the cows doubtless brought forth their young—generally one at a birth—in the more secluded parts of the forest, where they would be well concealed among the bracken and other covert, just in the same way as do those of the modern white Chillingham park-cattle.

P.S.—Since the above was in type an article by Mr. K. v. d. Malsburg¹ on a dwarf form of aurochs from the superficial formations of Belgium has been received. This race, for which the name *B. (urus) minutus* is proposed, was contemporary with the mammoth, and is regarded as the intermediate form between the typical aurochs and many of the breeds of domesticated cattle.

¹ *Bull. Internat. Ac. Sci. Cracovie*, 1911, pp. 340-348.

CHAPTER IV

BRITISH PARK-CATTLE

IN former days a number of parks in Great Britain were noted for possessing herds of white cattle, which roamed at will in a more or less nearly wild condition over considerable areas. These park-cattle, which appear to have been mainly peculiar to the British Isles, were long regarded as truly wild, and were named by Colonel Hamilton Smith¹ the white urus (*Urus scoticus*). This view is, however, a completely mistaken one, and park-cattle are in reality partially domesticated albino breeds.

All British park-cattle, when pure-bred, are white with the exception of the ears and muzzle, and sometimes the front of the legs, which may be either red or black, while the horns are whitish with black tips. In size these cattle are small, but their proportions are nearly perfect, the head being small, the back straight, and the legs short. Larger or smaller herds of these cattle were formerly kept in the following parks, namely, Auchencruive (Ayrshire), Barnard Castle (Durham), Bishop Auckland (Durham), Blair Athole (Perthshire), Burton Constable (Yorkshire), Cadzow Castle (Lanarkshire), Chartley Park (Staffordshire), Chillingham Castle

¹ In Griffiths' *Animal Kingdom*, vol. iv. p. 417, 1827.



FIG. 1. HEAD OF CHILLINGHAM BULL



FIG. 2. HEAD OF CHARTLEY BULL

(Northumberland), Ewelme Park (Oxfordshire), Gisburne Park (Yorkshire), Hoghton Tower (Lancashire), Holdenby Park (Northamptonshire), Kilmory House (Argyllshire), Leigh Court (Somersetshire), Lyme Park (Cheshire), Middleton Park (Lancashire), Naworth Castle (Cumberland), Somerford Park (Cheshire), Whalley Abbey (Lancashire), and Wollaton Park (Nottinghamshire). Of these numerous herds the only ones now remaining are those at Cadzow, Chillingham, Kilmory, Lyme, and Somerford.

One of the most famous herds of these cattle is that of Chillingham, which has formed the subject of many descriptions. There is some doubt as to the date of the enclosure of Chillingham Park, which, however, probably took place early in the thirteenth century; and there is undoubted evidence of the existence of the herd rather more than two hundred years ago. In appearance the Chillingham cattle are small, with moderately rough and curly coats, and short upwardly-directed horns. At the present day the insides of the ears and the muzzles are red; but it appears that in 1692 black ears were more numerous than red, and that the present colouring has been produced by selection. The upward direction of the horns serves at once to distinguish these cattle from the aurochs; but this feature may be of comparatively recent origin.

The Cadzow cattle, belonging to the Duke of Hamilton, inhabit a smaller area than those at Chillingham, and are therefore less wild. They differ from the Chillingham breed in having the ears and muzzles black, while there is also a greater or smaller amount of black on the front of the fore-legs. Their heads are also more rounded, and their limbs

stouter, and very generally the cows are devoid of horns, those of the bulls having much the same upward direction as in the Chillingham breed. This herd is believed to be very ancient.

Very different in appearance from both the above is the Chartley breed, of which, as having recently become nearly extinct, a somewhat fuller account may be given. There is historical evidence to show that Chartley Park, till 1903 the property of Earl Ferrers, was formed by enclosing about one thousand acres of the great forest of Needwood in the reign of King Henry III, probably in the year 1248 or 1249; and it is also stated that a number of the half-wild cattle which then roamed through Needham Forest were driven in and enclosed in the park.

The Chartley cattle differ from the Chillingham breed not only by their black, in place of red, ears, but likewise by their outwardly-directed, wide-spreading horns, which approximate in this respect to those of the modern longhorn breed, and are thus quite different from the upright, pitchfork-like horns of the Chillingham herd. In this particular the Chartley breed resembled the one formerly kept at Lyme Park.

In common, I believe, with other park-breeds, the Chartley cattle exhibited a strong tendency to produce black calves; and unless these had been continually weeded out, there is little doubt that the breed would have ultimately become black. The importance of this will be mentioned later.

From what is known of the history of the Chartley herd in modern times, its extinction appears to have been due to continued in-breeding, owing to over-anxiety on the part of its owners to preserve the

breed in its pristine purity. Possibly also the extinction was accelerated by the vigorous elimination of all black calves, which not improbably represented the strongest and hardiest type of the breed. Although it is stated that during a great part of the nineteenth century the number of these cattle did not exceed thirty, it is known that in the spring of 1851 there were eight-and-forty head. By the summer of 1874 these had, however, diminished to twenty-five, of which fifteen were cows and heifers. Three years later the herd comprised only twenty head, of which no fewer than ten or eleven were bulls, the large number of that sex being of itself a clear sign of decadence and degeneration. Between 1877 and 1903 there is a dearth of information, but in March of the latter year, when Chartley was purchased from Lord Ferrers by Colonel W. N. Congreve, only eight head of cattle remained. These were purchased on behalf of the Duke of Bedford, and removed to the park at Woburn, in the hope that it might be possible to resuscitate the breed. It was, however, soon found that nearly all the members of the remnant of the herd were more or less severely affected with tuberculous disease, and the cows rapidly died off, till in 1908 only one black bull and a white bull and cow remained. Of these the two latter were returned for a time to Chartley, but were once more brought back to Woburn, with the understanding that after death they should become the property of Colonel Congreve. The white bull—the last pure-bred white one—was killed in 1910, and is now exhibited in the Natural History branch of the British Museum. At that date there remained at Woburn a pure-bred black bull and a white cow. There was a

white bull produced by crossing the last pure-bred white bull with a longhorn cow.

The Kilmory herd was derived from the one which formerly existed at Blair Atholl. In the Lyme Park breed, interesting as being of larger size than any of the others, the hair is remarkable for its length and curliness, more especially on the shoulders; the ears are generally red, although occasionally black or bluish black, and the horns intermediate in form between those of the Chillingham and Chartley breeds.

The breed at Somerford Park, situated in the heart of what was formerly Maxwell Forest, was described by Mr. J. E. Harting as follows: "An ancient herd of white cattle, resembling those at Chartley, but polled, still exists here; and these animals are considered to be the best surviving representatives of the hornless and tame variety of the original wild white breed. The colour is pure white, the ears, rims of the eyes, muzzle, and hoofs being quite black. Like all other herds of the forest-breed they have a strong tendency to produce small black spots on the neck, sides, and legs."

During the nineteenth century a herd of white cattle was established by the late Mr. G. D. Assheton-Smith in Vaynol Park, near Bangor, North Wales. According to Mr. H. E. Forrest,¹ this herd has the following history:—

"About the year 1854 the late Sir John P. Orde, of Kilmory House, Argyllshire, purchased a pure-bred bull from Blair Atholl, where the remnant of an old herd of white cattle was being disposed of—they

¹ *The Vertebrate Fauna of North Wales*, London, 1907, p. 5; and *The Naturalist*, 1908, p. 334.

belonged to the black-eared group. This bull was put to several white Highland cows, and in the course of a few years a small herd of white half-breeds was produced. The cows in this herd were subsequently mated with a pure bull from Lord Breadalbane's (also of Blair Atholl stock), so that the progeny were three-quarter-bred Atholl cattle and one-quarter Highland. This herd was purchased in 1872 by Mr. Assheton-Smith, and removed to Vaynol. A bull from the Duke of Hamilton's herd at Cadzow was added to the stock in 1896. . . .

"The only trace of Highland ancestry noticeable in the Vaynol cattle is a certain shagginess about the forehead, and a sturdy look about the limbs, especially the fore-legs."

In spite of the long period they have been in the park, the Vaynol cattle are stated to retain to the present day many wild traits, so that they may be regarded as a revived park-breed. They become nervous at the approach of strangers, and, if approached, cease feeding, and arrange themselves in a compact body, with the bulls and steers in the van and the calves in the centre. After standing for some time to gaze, if the approach is continued, they gallop to a distance, wheel round into the same formation as before, and watch events. Old bulls driven from the herd are apt to be dangerous. Like those of the Chillingham herd, the cows drop their calves in thick covert; and if the latter are disturbed they have no hesitation in charging the intruders.

Before the sale of the Chartley herd—referred to above—some crosses had been effected between those cattle and the Vaynol herd; and at the sale Mr. F. A. Brace, of Needwood House, Burton-on-Trent, pur-

chased several of these Vaynol-Chartley hybrids, with the object of establishing a herd at his own seat, which should be suitable for commercial purposes, and yet retain as much as possible the characters of the old park-breeds. When the best Vaynol-Chartley bull was crossed with a red shorthorn, the result was a calf of the same type as the sire, thus showing the prepotency of the old park stock. All these half-bred cattle are perfectly quiet, and the cows are good milkers, so that strong hopes are entertained that the experiment will prove a complete success.

It should be added that the Vaynol cows frequently produce black calves, which are always shot by the herdsmen.

Lord Dynevor owns a herd of much the same type at Dynevor Castle, Carmarthenshire, but of this I have no particulars.

Another herd of white cattle with black ears and muzzles was started in 1895 by Mr. G. H. Dawkins at Wilcote, Charlbury, Oxfordshire, and in 1910 comprised thirty head. These cattle, which are of the long-horned type, are derived from cows obtained from Mr. Mathias' herd of white Pembrokes at Lamphey and others from Lord Dynevor's estate, and from bulls belonging to the same two owners together with one Vaynol-Lamphey and Dynevor-Lamphey. These cattle are quite domesticated, the cows being regularly used for dairy purposes, and yielding a fair supply of milk. They are of a hardy type, and lie out in the fields throughout the winter; but at that season the cows are regularly fed at milking time. The calves, too, are fed on oilcake till eighteen months old, and are not turned out in the fields during their first winter.



FIG. 1. WILCOTE WHITE CATTLE



FIG. 2. VAYNOL BULL

In view of the great discrepancy of opinion as to the origin and relationships of white park-cattle, it will be advisable to give a review of some of the leading views which have been expressed on this subject.

To go back to the reign of King Knut (Canute), A.D. 1014–1035, it is stated in the forest-laws that “there are also a great number of cattle which, although they live within the limits of the forest, and are subject to the charge and care of the middle sort of men, or regadors, nevertheless cannot at all be reputed beasts of the forest, as wild horses, *bubali*, wild cows, and the like.” In this case, as has been pointed out by Mr. J. E. Harting,¹ the word *bubali* is almost certainly intended to indicate the wild aurochs, just as it is in a passage cited in the preceding chapter (p. 39). The forest-cattle of Knut’s time were, therefore, it may be assumed, not aurochs; and it is also practically certain that they were not white, although they may possibly have presented a tendency to albinism; for, as stated above, the white park-breeds were only kept true by the elimination of dark-coloured calves.

Nevertheless, there were white cattle—and these with red ears—at an even earlier date in Britain, for we find in the Welsh laws of Howell Dha, promulgated about the year 940, mention of such animals, which were ordered to be paid in compensation for any offences committed against the princes of Wales. These, however, as pointed out by Mr. Harting,² were manifestly a domesticated breed, and doubtless more or less nearly similar to the modern strain of

¹ *Extinct British Animals*, London, 1880, p. 221.

² *Op. cit.* p. 220.

white Pembrokes produced by crossing and selection at Lamphey Court, Pembrokeshire.

More than a century after Knut's time, namely, about the year 1174, the chronicler Fitz-Stephen refers to forest-bulls (*tauri sylvestres*) as being then common in the forest near London, these half-wild cattle being doubtless more or less nearly the same as those enclosed when Chartley Park was established three-quarters of a century later.

All this points to the conclusion that park-cattle were not originally white, but have become so by selection and elimination since they have been enclosed in their respective domains, where they constituted several more or less distinct breeds, perhaps respectively representative of local types of the original forest-cattle. And if this be so, white park-cattle did not come into existence till something like a thousand years after the Roman occupation of Britain.

Turning to what other writers have stated with regard to the origin of these park-cattle, we find Col. Hamilton Smith¹ writing in 1827 as follows: "The white urus (*Urus scoticus*) is a wild breed of the ox, the probable remains of the genuine urus. It is of small size, and ranged formerly through the woods of southern Scotland and the north of England. When this breed was exterminated from the open forests is unknown; but some time before the Reformation, the remnants were already confined in parks belonging to ecclesiastical establishments. . . . Before they were kept in parks they were probably larger and more rugged."

In this passage it should be noted that the author

¹ *Op. cit.* p. 417.

unhesitatingly regards park-cattle as of indigenous origin, and directly descended from the aurochs, although he makes no attempt to explain why they were white instead of black.

Much the same view is expressed by Professor David Low in his *British Domesticated Animals*,¹ where he considers park-cattle to be specifically identical alike with the aurochs and with domesticated cattle, and directs special attention to their similarity to the white strain of the Pembroke breed, of which he remarks that "their whole essential characters are the same as those at Chillingham and Chartley Park, and elsewhere. Their horns are white tipped with black, and extended and turned upwards in the manner distinctive of the wild (park) breed. The inside of the ears and the muzzle are black, and their feet are black to the fetlock joint. . . . Individuals of this race are sometimes born entirely black, and then they are not to be distinguished from the common cattle of the mountains."

He then goes on to say that the white coat of park-cattle is that which the animals would probably assume in a forest country with the climate of Albion—which is a manifest fallacy.

An entirely new departure was taken in 1849 by Sir Richard Owen, who, in his *British Fossil Mammals and Birds*,² wrote that instead of being descendants of the aurochs, British cattle — and especially the park-breeds — were more probably "derived from the already domesticated cattle of the Roman colonists, of those *boves nostri*, for example, by comparison with which Cæsar endeavoured to

¹ London, 1842 (p. 240 of the smaller 2nd edition).

² P. 500.

convey to his countrymen an idea of the stupendous and formidable *uri* of the Hercynian forests."

Later on, in the same work,¹ Owen, however, observed that if, in spite of his first statement, "it should still be contended that the natives of Britain, or any part of them, obtained their cattle by taming a primitive wild race, neither the bison nor the great urus are so likely to have furnished the source of their herds as the smaller primitive wild species, or original variety of *Bos*, which is the subject of the present section."

Still later he adds² that "in this field of conjecture the most probable one will be admitted to be that which points to the *B. longifrons* (the aforesaid smaller wild species or variety) as the species which would be domesticated by the aborigines of Britain before the Roman invasion."

It has, however, been pointed out by Professor W. B. Dawkins³ that this so-called *B. longifrons*, better known as the Celtic shorthorn, was not a wild species at all, but a domesticated breed dating from the later (Neolithic) Stone Age.

"When, therefore," writes Professor Dawkins, "the Romans conquered Britain, there was no need of their importing cattle from Italy, for they found a breed used to the climate and to the half-wild life, which, in a country for the most part uncleared, must have been their lot. During the Roman occupation the animal was the staple meat of the country."

Later on in the same paper Professor Dawkins expressed the opinion that the Celtic shorthorn was the progenitor of the modern small Welsh and Scotch

¹ P. 509.

² *Op. cit.* p. 514.

³ *Quart. Journ. Geol. Soc.*, London, vol. xxiii. p. 183, 1867.

cattle, whereas the larger English breeds were derived by importation from a Continental source. A year previously he had stated¹ that "the half-wild oxen of Chillingham Park in Northumberland, and other places in northern and central Britain, are probably the last surviving representatives of the gigantic urus of the Pleistocene period, reduced in size and modified in every respect by their small range and their contact with man."

As regards the latter point Professor Dawkins is in accord with Professor Low; but if the latter be right, as he probably is, in regarding the white, and therefore also the black, Pembroke breed as near akin to park-cattle, which both writers agree in deriving from the aurochs, it is obvious that Pembroke, and thus Scottish, cattle must likewise have the same original ancestry, although the latter may trace their descent through the Celtic shorthorn.

The next contribution to the subject demanding notice is one by Professor T. M'Kenny Hughes, of Cambridge, entitled "The more Important Breeds of Cattle which have been Recognised in the British Isles, etc. etc."² In this memoir the author revives and amplifies Owen's theory that white park-cattle are descended from white or fawn-coloured Italian cattle introduced by the Romans into Britain. It is stated that skulls from the Roman rubbish-heaps indicate a breed such as would be produced by crossing Roman cattle with the Celtic shorthorn; and also that if a selection of the lighter-coloured individuals of the common draught-ox of Italy were turned out in a park in England, no one would

¹ *Op. cit.* vol. xxii. p. 398, 1866.

² *Archæologia*, London, vol. lv. p. 125, 1896.

suspect that they did not belong to the wild white breed. There would be less difference between them and the Chillingham cattle, in essential characters of form and colour, than there is, for instance, between the Chillingham and Chartley cattle."

If this be the case—which I do not for one moment admit—how, it may be asked, is the conclusion reached that the skulls from the Roman kitchen middens indicate a cross between Celtic shorthorns and Italian cattle? Surely a cross between the former and park-cattle would have produced the same type.

Much is made of the difference in the direction of the horns of the Chillingham cattle as compared with those of the aurochs, and it is stated that in this respect the Chillingham breed resembles Italian cattle.¹ But the difference in this respect between Chillinghams and Chartleys is ignored; and the alleged resemblance between the horns of Chillingham and Italian cattle is nothing near so close as Professor Hughes imagines; indeed, the two types are as distinct as they well can be.

But, apart from this, the great majority of Italian cattle are pale fawn-coloured or silver-grey animals, often with a white ring round the eye, and their calves are normally reddish brown in the first coat² and apparently never black. Fawn or silver-grey is, however, unknown among the native British cattle, which are either black, black-and-white, white, red-and-white, red, or brown, strawberry roans being obviously a mixture of some of the above. Now, if

¹ In this paper the figures of the skulls of a Chillingham bull and a Piedmont ox are transposed.

² See Hilzheimer, *Korrespondenz-Blatt. Deutsch. Ges. für Anthropol.*, *msw.*, vol. xxxix., 1908.

Italian cattle were introduced into Britain in sufficient numbers to modify all the cattle of the British Islands (which Professor Dawkins distinctly affirms they were not), we ought to find pale fawn-colour prevalent among the modern native breeds.

Again, even if it were admitted that cattle imported by the Romans might have modified the native breeds in the south and central counties of England, how can it be conceived that they could have equally affected the cattle in Northumberland and parts of Scotland, from the descendants of which the Chillingham and Cadzow park-cattle were derived?

But, to put the argument in another way, park-cattle, as mentioned above, very frequently throw black calves, and are thus evidently descended from a black stock. How, then, can they possibly bear any relation to white or fawn-coloured Italian cattle, which never seem to have black calves, are apparently related to the long-horned Podolian cattle of Hungary, and are evidently an altogether distinct and specialised type? If the modern park-cattle are derived from such a light-coloured foreign stock, they could not have remained white from Roman times till the enclosure of the British parks and yet frequently produce black calves; and if their ancestors did not throw black calves, how comes it that their descendants do so?

In 1898, in a paper on the white Chartley cattle, Professor Dawkins¹ resumed the subject of the origin of the Celtic shorthorn and its relationship to British breeds, writing as follows:—

“This small short-horned breed was introduced

¹ *Transactions of North Staffordshire Field-Club*, vol. xxxiii., p. 48, 1898-9.

by the Neolithic [Later Stone-Age] herdsmen and farmers from the Continent as a domesticated animal. The place where it was originally domesticated is unknown, but it may be inferred from the absence of any wild cattle of this species in Europe that it was introduced from the East, from some part of middle Asia, into Europe. It was introduced into the British Isles by the small dark Iberic race, now mainly to be found in the western parts of our Isles, in Wales, Scotland, and Ireland, and still to be recognised elsewhere in our population by the small dark folk. These cattle were small and dark, with small horns, and were the only domestic breed in this country, so far as I know, throughout the whole of the Bronze and Iron Ages, and during the time when Britain formed a part of the Roman Empire. The evidence on this point presented by the study of the refuse-heaps leaves no room for doubt. These small cattle are also represented in the refuse-heaps of the post-Roman period in Britain in various places, and still live as the small dark breeds of Scotland, Ireland, and Wales. This breed contrasts in every particular with the large white [Chartley] cattle before us. They differ in colour and size and in proportions. There is no evidence of any large domestic cattle in Britain until the arrival of the English, who came over here with their families, their flocks and herds, and carved for themselves out of the province of Britain the land called after their own name.

“The larger breed was domesticated on the Continent, as Rütimeyer has shown, in the Neolithic Age, and occurs in the refuse-heaps accumulated round the pile-dwellings in Switzerland. It is descended from the great wild urus [aurochs], which

abounded in the forests of the Continent in Prehistoric times, and lingered in Europe as far down as the time of Charles the Great. It has nothing to do with the large, fawn-coloured cattle of Italy, as suggested by Professor M'Kenny Hughes. These are derived from the East and probably from Egypt. This larger breed spread over the Continent of Europe through the Prehistoric and early Historic period, and became defined from all others by its white colour and red or black ears, not merely in the British Isles, but also in Spain. It cannot be traced further back in our land than the time of the English migration. It may very well have been introduced even later than this by the Scandinavian Vikings, who were in the habit of taking cattle on shipboard and carrying them to foreign lands."

In this paper the author repeats in the main his original views, but definitely regards the Celtic short-horn as of Asiatic origin; seeming thereby to admit Rüttimeyer's suggestion that it is a derivative from the humped zebu, a point referred to more fully in a later chapter. The view that the Celtic shorthorn is the ancestor of the modern Scottish and Welsh breeds is repeated; but the white park-cattle are assigned, apparently for the first time by this writer, to a Continental stock, although still stated to be derived directly from the aurochs. This, of course, is in direct opposition to the opinion of Low, by whom the Pembroke and the Chillingham cattle were, as already mentioned, considered to be closely allied native breeds; an opinion in which I fully concur.

This question is further discussed in the chapter on foreign breeds of cattle.

Here another point may be mentioned, namely, that the Chartley cattle show unmistakable signs of affinity on the one hand to the longhorn breed, and on the other to the above-mentioned white Pembrokes, which themselves approximate to the longhorn type, as is pointed out on page 336 of an article by Mr. H. E. Forrest,¹ published in 1908, on the origin of British "wild" cattle. Now it has been shown by Mr. R. Hedger Wallace on page 428 of an earlier paper on the same subject¹ that the old Craven breed of longhorns, as well as certain Irish cattle, always had a white line on the back, which he rightly regards as evidence of their descent from the aurochs. *Ergo*, if Chartley park-cattle and white Pembrokes are akin to longhorns, they, too, must likewise claim aurochs-descent. This is, in fact, admitted by Mr. Forrest, who shows, in the paper cited, by means of an illustration, that in the shape of their horns, and the straight line formed between their bases by the vertex of the skull, the Chartley and Lyme Park breeds come very close to the aurochs, whereas the Cadzow and Chillingham breeds are nearer in these respects to the Celtic shorthorn, in which the intercornual ridge of the skull is convex.

The importance of this paper consists in the admission that all park-cattle and the older British breeds are derived, either with or without the intervention of the Celtic shorthorn, from the aurochs; and this appears the common-sense view of the matter. The elaborate table of the origin

¹ "White Cattle: an Inquiry into their Origin and History," *Trans. Nat. Hist. Soc. Glasgow*, ser. ii. vol. v. pp. 220 and 403, 1898-99. In this paper, which contains a valuable bibliography relating to ancient and modern cattle, the author endorses, in the main, the views of Professor Hughes.

of the park and Highland breeds given by Mr. Forrest seems, however, scarcely justified by the facts at command.

In my own opinion the half-wild cattle which are known to have roamed through the British forests in the time of Fitz-Stephen, but whose precise origin and relationships cannot now be determined, may perfectly well have given rise to the various park-breeds, without the intervention of imported breeds. There is indeed direct evidence that in various parts of the country some of these forest-cattle were "rounded up" and driven in at the time of the enclosure of the great estates to form the basis of the local herds. Many of these forest-cattle, which at the time of the enclosure of the parks may have been already differentiated into distinct local breeds, were probably more or less dark-coloured—like the aurochs and the Celtic shorthorn; and if this be so, the pure white of the park-breeds was, as already suggested, produced by subsequent selection and elimination. There were, indeed, white cattle on the Cumberland moors in 1675,¹ but this was long after the enclosure of the parks.

The black Pembroke breed, and therefore probably also the Highland kyloes, appears nearly related to the stock from which park-cattle were derived; and the old longhorn breed seems likewise to have sprung from this same early stock.

In regard to the view that the old forest-cattle were mainly dark, it may perhaps be urged that as cattle which have run wild in the Falkland and Ladrone Islands are white with dark ears and

¹ Wallace, *op. cit.* p. 242.

muzzles, the same might well have been the case with the old British breeds; but to this it may be replied that there is no evidence that the aforesaid island-cattle habitually produce black calves, as is so commonly the case with the British park-breeds.

A few words are advisable in this place in connection with the fact that whereas the ears of the Chillingham cattle are now red, in former days they were generally black. Thus Thomas Bewick in his *General History of Quadrupeds*, the first edition of which was published in 1790, stated that in his time a few of these cattle had black ears; while we learn from another source that in 1692 black ears were in the ascendancy. The change, which, as Mr. Harting remarks, was probably brought about by selection, is a kind of retrograde evolution. For, as is demonstrated by the case of the Malay bantin, in which, as mentioned above, the cows and calves are red, while the old bulls are black, it is evident that black is what naturalists call a specialised type of colouring among cattle, whereas red is the primitive or original colour; and in passing from black to white, in the development of albinism, red might therefore be naturally expected to occur as an intermediate stage, although, as a rule, there is a sudden jump from black to white. In this connection it is noteworthy that in black-and-white cattle which are tending to complete albinism the ears retain the black longer than any other part, this being specially exemplified by individuals in which the black of the body has become broken up to a greater or less extent into a kind of bluish grey.

Although the habits of the Chillingham cattle are described in so many works that repetition might

seem unnecessary, it is important that these should be briefly noticed, as they probably throw light on the mode of life of the aurochs, since it is a well-known fact that domesticated animals which have reverted to a more or less nearly wild condition tend to resume the habits of their ancestors.

One of the earliest accounts of the Chillingham herd was given by George Culley in his *Observations on Live Stock*, published in London in 1786, who wrote as follows:—

“At the first appearance of any person, they set off in full gallop, and, at the distance of about two hundred yards, make a wheel round, and come boldly up again, tossing their heads in a menacing manner: on a sudden they make a full stop at the distance of forty or fifty yards, looking wildly at the object of their surprise; but upon the least motion being made, they all again turn round, and fly off with equal speed, but not to the same distance, forming a shorter circle, and again returning with a bolder and more threatening aspect than before; they approach much nearer, probably within thirty yards, when they again make another stand, and then fly off: this they do several times, shortening their distance, and advancing nearer and nearer, till they come within such a short distance that most people think it prudent to leave them, not choosing to provoke them further. . . .

“When the cows calve, they hide their calves for a week or ten days in some sequestered situation, and go and suckle them two or three times a day. If any person come near the calves, they clap their heads close to the ground, and lie like a hare in a form to hide themselves.”

A later account, based on observations made in 1838, was published by Mr. J. Hindmarsh in the second volume of the *Annals of Natural History*, 1839. In this account, which is very similar to that of Mr. Culley, the author states that these cattle "have pre-eminently all the characteristics of wild animals, with some peculiarities which are sometimes very curious and amusing. They hide their young, feed in the night, basking or sleeping during the day; they are fierce when pressed, but generally speaking very timorous, moving off on the approach of any one, even at a great distance." It is added that the old bulls fight fiercely among themselves for the mastery of the herd; and also that old and feeble individuals are gored to death by their companions.

In neither of these accounts is any mention made of the old and effete bulls being driven away from the herd and taking to a solitary existence; although that such was the case with the aurochs may be inferred from what takes place with the gaur, or Indian wild ox. Low states that the habit of killing the feeble members of the herd by the Chillingham cattle, is a wild trait, but no mention of any such habit is made by Mr. G. P. Sanderson in his *Thirteen Years among the Wild Beasts of India*¹ in the case of the gaur. Neither is it mentioned by either of the writers above quoted whether Chillingham cattle are in the habit of feeding down-wind, although from its prevalence among ordinary domesticated cattle this practice probably exists. As regards the habit of lying out in the open during periods of repose, this has probably

¹ London, 1890.

been acquired by the Chillingham cattle, as gaur, according to Mr. Sanderson,¹ after feeding till about nine o'clock in the morning "then rest, lying down in bamboo-cover or light forest until the afternoon, when they rise to graze and drink." Later on (p. 246) he adds that almost the only difference between the habits of gaur and those of elephants is that while "the former timidly confine themselves to the forest, the elephants roam in herds or singly far out into open and partly-populated country." Such forest-dwelling habits were probably common to the aurochs, to which the gaur approximates in general colour, although Professor Hughes² has denied that park-cattle can be derived from an ancestor which dwelt in forests. "Cattle," he writes, "only seek woods for shelter, and dense and extensive woods would not facilitate but arrest the migration of animals that usually feed in the open plains." This obviously applies only to park-cattle and the ordinary domesticated breeds, whose habits have varied to some extent from those of their wild ancestors.

In this place it may be mentioned that the normal period of gestation in domesticated cows is nine months, or the same as in the aurochs; and that breeding commences when the animals are two years old. In the Channel Islands and shorthorn breeds, as well as that of Shetland, maturity occurs, however, at an earlier period; while in the larger German breeds gestation is stated to be longer than in the smaller kinds.³ With rare exceptions, only one calf is produced at a birth; and according to Thomas

¹ *Op. cit.* p. 245.

² *Op. cit.* p. 20.

³ Darwin, *Animals and Plants under Domestication*, vol. i. p. 90, 1885.

Bell,¹ if a "cow produce twin calves, one of each sex, the male is perfect, and the female barren; which last is termed a free martin. This is so generally true, that there are not, I believe, more than two or three instances of its fertility." Still more rarely three calves are produced at a birth.

Normally the central pair of lower milk-incisor or front teeth of the calf are shed and replaced by their permanent successors in the tenth month; the adjacent, second, pair is replaced in the sixteenth month; and by the third year the outermost, or third, pair, together with the adjacent and nearly similar pair of canines, has likewise been shed and replaced. Here again, however, selection and specialisation have produced abnormal acceleration in certain breeds, so that there is a difference of no less than six months in the date of the appearance of the various pairs of lower incisors.²

¹ *British Quadrupeds*, 1st ed. p. 417, 1837.

² Darwin, *op. cit.* p. 91.

CHAPTER V

DOMESTICATED BRITISH CATTLE

THE British Islands have long been celebrated for the excellence of their cattle, of which, apart from those of the parks and Channel Islands, seventeen more or less distinct breeds were recognised by Low in his *Domesticated Animals of the British Islands*, while a few have been established subsequently. The most primitive breeds are found in the Shetlands, the Scottish Highlands, Wales, and Ireland, these being of relatively small size; while specialised, and for the most part large, breeds are mainly characteristic of the midland and southern districts of England. Some at least of these larger breeds are believed by Professor Hughes¹ to have originated from Friesland cattle and other long-horned breeds from Jutland and the lower part of the valley of the Elbe, which are said to have been imported during the fifth century onwards. Be this as it may, the modern British breeds are all more or less distinct from those of the Continent; and the difference between the extreme types is so great that, if they were wild, in place of domesticated, animals, many of them would undoubtedly be entitled to rank as distinct species. In the Highlands of Scotland

¹ *Archæologia*, vol. lv. p. 30.

and the mountains of Wales cattle were always reared for the sake of their flesh, milk, and hides, but in the lowlands of England oxen were formerly largely employed for ploughing and other kinds of draught, and for this purpose large and heavy animals, with plenty of bone, were essential. On heavy ground and bad roads these draught oxen were of special value, for, although slow, they have great strength, and will continue to pull in cases where most breeds of horses would refuse to work.

As mentioned in an earlier chapter, British cattle, apart from the Channel Islands breed, are either black, black and white, white, red and white, or red, passing into reddish brown on the one hand or dun on the other. Brindles are occasionally met with; but these appear in all instances due to crossing. There are now no silver-grey or pale fawn-coloured breeds comparable to those of Italy. The mountain breeds are generally whole-coloured—either black or red or reddish brown; but those of the plains display, as a rule, a more or less marked tendency to albinism, either on the head and limbs, or all over the body.

The first breed for notice is that of the Shetlands and Orkneys, the members of which, like the local ponies, are of small size and hardy constitution. These cattle, although smaller, are near akin to those of Norway—of which kingdom the Shetlands were formerly a part—and markedly distinct from those of the Scottish Highlands. Low describes them as being of good shape, with short horns, a soft skin, and a coat varying in colour and frequently parti-coloured, its tint being usually lighter than that of the Highland breed. Strange to say, they come to



FIG. 1. HIGHLAND BULL



FIG. 2. WELSH BULL

maturity earlier than any other British cattle—a remarkable feature in such a primitive breed. They are, like Norwegian cattle, good milkers, and they yield beef unsurpassed by that of any of the mainland breeds. Orkney cattle, as a rule, are less pure-bred than those of the Shetlands, owing to having been crossed with bulls imported from Caithness. Formerly these cattle were probably, for the most part at any rate, hornless.¹

The Highland, or properly West Highland, cattle form an unmistakable and picturesque breed rendered familiar in England during the Victorian period by the paintings of Sir Edwin Landseer. Small in size, these cattle are rough-coated animals, especially in winter, with relatively long horns, which frequently turn upwards at the tips in a more or less marked degree, and short, stout limbs. The dewlap is well developed, and there is a rudimentary mane on the neck. The colour ranges from yellow dun, red, black, and brindle to a mixture of red and black, with a predominance of the former; but whole-coloured animals are much preferred to those with broken-coloured coats. The hair may be as much as six inches in length. In light-coloured animals the horns are whitish straw-colour, but in darker individuals they have the tips black. The colour of the muzzle varies, in accordance with that of the coat, from buff or flesh-colour to black. Bulls reach a weight of about 1000 lb. The breed was originally black, and in Youatt's well-known work on cattle Mr. Malcolm M'Neill, of Islay, stated that "the Highland bull should be black, the head not

¹ See Wilson, *Scientific Proceedings R. Dublin Soc.*, ser. ii. vol. xii. p. 160, 1909.

large, the ears thin, the muzzle fine and rather turned up."

In temperament "kyloes," as these cattle are called in their native country, are wild and bold, not to say fierce. They yield comparatively little milk, and belong to what is known as the "beef type" of cattle.

Near akin to the West Highland is the Pembroke breed, typically from the south-western part of the Principality, but extending into the mountainous portions of the adjacent counties, and indeed of Wales generally. In size "Welsh runts," as they are commonly termed by graziers, are about equal to the larger strain of the West Highland breed; but they are better milkers, and afford excellent meat, with a large proportion of fat. The black-tipped horns are fine and tapering, with an upward turn at the tips; and come very close to those of some of the white park-breeds. These cattle also resemble the latter in the unctuous yellow skins, of which the bare parts are black. The original colour is black; and this is strictly adhered to by breeders, who consider any mixture of white a mark of inferiority. Inferior strains of the breed are met with in the mountainous districts of Carnarvon and Merioneth; while another strain, of larger size, inhabits Anglesea, where, however, it has been crossed with Irish longhorns. Indeed, throughout Wales as the Pembroke passes from the mountains to lower ground it tends to assume the characters of the longhorn. For the illustration of a Welsh bull I am indebted to Colonel H. Platt, C.B., of Gorddinog, Llanfairfechan.

The longhorn character is likewise exhibited by the white Pembroke cattle kept by Mr. Charles

Mathias at Lamphey Court, Pembrokeshire, which, as mentioned in the last chapter, closely approximate to the Chartley park-breed. This herd is stated¹ to have been produced in recent times by selecting white individuals from herds of ordinary Pembroke cattle and breeding from them; but, as recorded in the preceding chapter, a white breed with dark ears has been known in Pembrokeshire from at least as early as the tenth century.

As the intimate relationship existing between Pembroke and park cattle, and the affinity of both to the aurochs, have been discussed in Chapter IV, it will suffice to state that the Pembroke and West Highland breeds are undoubtedly indigenous to Great Britain, and are of great antiquity.

It remains to add that in Glamorganshire the Pembroke cattle are represented by an allied breed with red coats, which approximates to the Hereford, and is described in connection with the latter. The connection between the Pembroke and Glamorgan breeds is of interest as showing how easily black passes into red among cattle.

As was pointed out by Professor David Low² so long ago as 1842, the small Kerry cattle of the mountains of western Ireland, which are nearly related to the Pembroke breed, are of special interest on account of the frequent presence of a white line along the spine, doubtless a direct inheritance from the aurochs. Apart from this dorsal white line, and frequently another along the belly, the original Kerry was generally black, although it might be red, black and white, or black and red. The black-tipped horns

¹ *Naturalist*, 1908, p. 336.

² *Domesticated Animals of the British Islands*, 8vo ed. p. 309.

are fine, long, and directed upwards at the points; the skin is of the same soft and unctuous character and yellow or orange colour as that of the Pembroke breed, and the legs are long and slender. In many instances the cows do not stand more than 40 inches in height, with a weight of from 500 to 600 lb.; but the bulls are larger, weighing from 800 to 1000 lb. In addition to their hardy nature, which has given to the breed the name of "the poor man's cow," Kerries are noted for their abundant yield of milk, which, making due allowance for their small size, is proportionately larger than in any other British breed, exclusive of those of the Channel Islands.

Smallest of all British cattle is the so-called Dexter-Kerry, a sub-breed stated by Low to have been first produced by selection from the Kerries themselves about a century ago by a Mr. Dexter, reputed to have been agent to a former Lord Hawarden. The statement is, however, disputed by Professor J. Wilson,¹ who believes the breed to be due to a cross between Kerries and Devons, which took place not later than the early part of the nineteenth century. Be this as it may, Dexter-Kerries are either black, red, or roan in colour, without a light dorsal streak; in build they are more compact and bulky than the typical Kerries, with heavier head and neck, and shorter limbs.

The next breed for notice is the one formerly known as polled Aberdeenshire, but now called Aberdeen-Angus. The home of this fine hornless breed is in north-eastern Scotland, more especially Aberdeenshire, Kincardineshire, and Forfarshire. In the south of Aberdeenshire these cattle were formerly known as "Buchan humlies," while in the Angus

¹ *Scientific Proceedings R. Dublin Soc.*, ser. ii. vol. xii. p. 1, 1909.

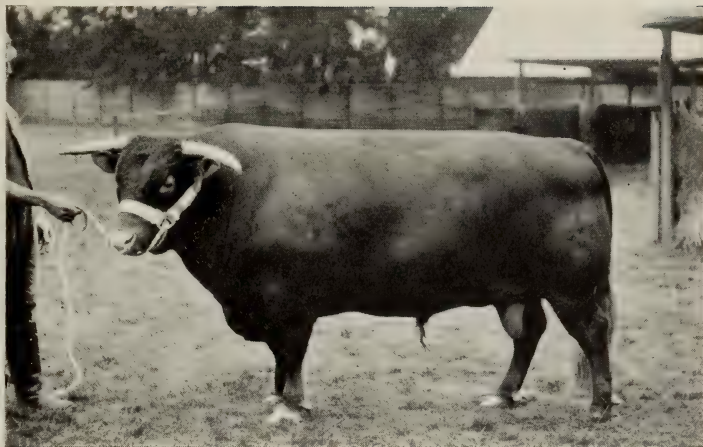


FIG. 1. DEVON BULL



FIG. 2. SUSSEX BULL

district of Forfarshire they were termed "Angus doddies," "humle" and "dodded" being the Scottish equivalents for polled or hornless.

In addition to the absence of horns, Aberdeen-Angus cattle are distinguished by their great size—bulls weighing from 2200 to 2800 or even 3000 lb.—the depth of the body, and the shortness of the legs; and they come to maturity at an early age. The origin of the breed is a matter of speculation, although Low believes that it is related to the West Highland, and that it was derived mainly by selection from a long-horned indigenous breed, perhaps by the aid of crossing with polled breeds. It is known to have been in existence since the middle of the eighteenth century. Aberdeen-Angus have been introduced into the United States and Canada.

A second polled Scottish breed is the Galloway, of which the derivation is likewise obscure, although there is some evidence in favour of its antiquity. These cattle are natives of the coast-districts of south-western Scotland, comprising the counties of Wigton and Kirkcudbright together with portions of Ayr and Dumfries, which collectively constituted the old province of Galloway. It has been stated that about the year 1750 most Galloway cattle carried horns, but there is some doubt with regard to the authenticity of the assertion, and some earlier accounts suggest that the absence of horns is a feature of great antiquity. Most writers believe the Galloway to have been originally derived from the West Highland kyloes; and it is noteworthy that skulls of polled cattle apparently indistinguishable from this breed occur in a Roman rubbish-heap at Newstead, near Edinburgh.

Galloways, in addition to the absence of horns, are characterised by their shortness of limb and the low elevation of the under surface of the body above the ground. Although a brownish or reddish tint is not infrequent, black is the typical colour, and the coat, especially in winter, is very long and thick. The somewhat cylindrical body is longer than in the Aberdeen-Angus, with a flatter type of rib, another distinctive feature being the backward position of the ear, which should be upright, fine, pointed, broad, and well clothed with long hair.

Soon after the act of union between England and Scotland herds of Galloways were regularly driven to England for sale; and by Low's time (1840) the annual number which came to the English market was estimated at fully 20,000. They were driven southward in summer, and after being kept over one winter in England, mostly in the good pasture of the eastern counties, they were ready for market by the following Christmas. To the United States and Canada these cattle began to be imported about the middle of last century.

A breed of polled cattle, but red instead of black, is indigenous to East Anglia, and is now generally called the red polled breed, although it is referred to in Low's book as the polled Suffolk. As a matter of fact, however, there were originally two strains of East Anglian hornless cattle, one in Suffolk and the other in Norfolk; and it is to the union of the two that we owe the modern breed. Polled cattle of the same type also extend into Cambridgeshire and part of Essex. The local breeds are of considerable antiquity, but there is the usual uncertainty as to their origin. They differ from

Galloways not only in colour and their inferior size, but likewise in their thinner hides and soft satiny coats; and since the same characters recur in the polled cattle of Hungary and central Russia, it has been suggested that the latter form the parent stock.

Formerly the Suffolk strain was generally of a mouse-dun colour, but, later on, this was changed to reddish brown, or brown and white. The Norfolk strain, on the contrary, appears to have been always red, with a white or mottled face, and is stated to have been originally horned—the latter feature, if authentic, militating against their derivation from a Continental polled breed. In the modern breed deep red, with or without some white on the under-parts and a white tail-tuft, is the favourite colour; but many animals are of a lighter red. In size red polls are medium. They may be regarded as “all-round” cattle, being equally good for the dairy and for the butcher.

The fourth and last breed of completely hornless cattle native to the British Islands is the polled Irish, which, although but little known and appreciated in England, appears to be of great antiquity. Their general colour is light brownish, on which account they may very probably be near relatives of the polled Suffolk—which were formerly known as Suffolk duns—although they are considerably the superior of the latter in the matter of size, equalling in this respect the larger strain of shorthorns. It has, however, been suggested that they may be the result of a cross between indigenous Irish and Dutch cattle. In Low's time the characteristics of the breed were being rapidly destroyed by crossing with shorthorns.

In connection with the former prevalence of a dun colour in the polled Sussex, Professor James Wilson¹ has brought together a considerable amount of evidence to show that dun and silver-grey were at one time common in the old Aberdeen breed, and also occurred, although to a less degree, in the other polled breeds. Of the British polled breeds collectively he writes that, in addition to being hornless—

“They were either light dun or yellow or dun, which showed that their more remote ancestors had been light dun, yellow having been got by crossing with red cattle, and dun by crossing with black.

“They were small, puny, short-legged, sickle-hocked, narrow-chinned, thin-fleshed, long-headed cattle, which were usually esteemed for the dairy. Those in Yorkshire and Ireland were the only exceptions; but the cattle in both those districts had long been crossed by larger and fleshier breeds of cattle.

“And from these circumstances, as well as from the fact that they differed entirely in the first two (that is, characters, in the absence of horns and in colour), if not also in the third, from other British cattle, we can scarcely conclude otherwise than that they were all of the same race.”

After mentioning that in the British Isles polled cattle were chiefly a coast type, it is added that the Shetland and Orkney cattle, which are admittedly of Scandinavian origin, were formerly to a great extent polled and dun; and since cattle of the same type are common in Scandinavia, where they are well represented by the indigenous fell breed (*fjäll*

¹ *Scientific Proceedings R. Dublin Soc.*, vol. xii. p. 149, 1909.

rasen), which is white or greyish white, often with dark spots, it is inferred that the British polled and Shetland breeds are likewise of Scandinavian origin, and were brought over by the Norsemen.

"The other places," continues the same writer, "in which Norsemen settled, and in which cattle bearing a resemblance to the hornless cattle of the British coasts live or lived till recently, are Normandy and the Channel Islands, Orkney, Shetland, and Iceland. The Norman and Channel Islands cattle are identified by their shape and by the presence of the two colours, silver-grey and yellow; those of Orkney and Shetland by shape and the dun colour; while those in Iceland were identified by shape and the absence of horns."

As to the date of this presumed importation of dun and hornless Scandinavian cattle into the British Islands, Professor Wilson is inclined to place this before the Norman Conquest, that is to say, previous to the year 1066.

Reverting to horned breeds, attention may be directed to the well-known red Devons, of which there are two distinct strains, the North and the South Devons, or South hams, the former being characterised by their meat-producing qualities, while the latter are more suited to the dairy. In earlier days North Devon oxen were largely used for ploughing; and it is stated that the first plough employed in North America was drawn by a pair of these fine cattle. The Devon breed is a very ancient one; and a line may be drawn across the county on one side of which are the North Devons, or "rubies," as they are locally called, and on the other the South Devon strain. Their uniformity in size and

colour is a notable feature of both strains. The origin of the breed is unknown, although it is undoubtedly indigenous to the south-west of England, where it is found in Somersetshire as well as in Devonshire.

Although the North Devons are bright red, the colour of the breed as a whole varies from dark to light red, the coat being fine with a tendency to curl; the only white permitted is on the hind portion of the under side of the body. The hair round the eyes and above the muzzle should, however, be cream-coloured, and the muzzle itself flesh-coloured. The lean and shapely head is surmounted in the cows by long, slender, spreading horns, curving upwards at the tips, of a waxy colour, becoming gradually darker towards the tips. In the bulls the horns usually grow directly outwards, but in some instances incline slightly upwards. The limbs are short and slender. As regards size, these cattle may be classed as medium, cows, which are relatively small in comparison with bulls, weighing from 1300 to 1500 lb., and bulls from 1500 to 2100 lb., the North Devon strain being inferior in size to the South Devon. At the end of the eighteenth century the breed was greatly improved by Francis Quartly, of Champson-in-Molland, near South Moulton. Devon cattle are believed to have been introduced into the United States at least as early as 1623, although it was not till 1817 that pedigree stock was imported. For a time the breed was esteemed in America, but of late years its popularity has declined.

Sussex, together with parts of Kent, Surrey, and Hampshire, is the home of a breed of red cattle near akin to the Devon, but dwelling on soil of an

entirely different character, thereby showing that there is no connection, as has sometimes been asserted to be the case, between the colour of the Devons and that of the rocks and soil of their native county. As compared with the Devon breed, Sussex cattle are larger, bigger-boned, and hardier in constitution, both breeds, in the opinion of Mr. H. Rigden, being probably derived from old medium-horned red cattle of the south and south-western counties of England. In colour, Sussex cattle should be wholly red, with white tail-tufts, but white flecks may appear on the body, and the muzzles of the bulls must be white. A century and a half ago it was noted that Sussex cattle, like the pigs of the same county, were unusually long-legged, and it has been suggested that this feature was due to the bad state of the roads. Be this as it may, when the Weald district was the centre of a great iron-producing industry the strong-limbed Sussex steers were specially well adapted for hauling timber through the heavy undrained tracks of the partially cleared forest. The Lyne herd, dispersed in 1903, was descended from the old working breed, and probably the oldest in Sussex.

The horns tend to be large and long, curving forwards and inwards in the cows, although nearly straight in the bulls; the skin is soft, thick, and in winter clothed with thick and frequently curly hair. In former days the Sussex were more like Devons than is now the case; but the cows of the modern breed are less prolific as regards milk than the South Devons. As regards the purposes of the butcher, Sussex oxen are almost equal to shorthorns.

Sussex cattle were introduced into the United

States only in 1884, and into Canada five years later. A well-known herd is kept at Lock, Partridge Green, Sussex, by Mr. W. A. Thornton, to whom I am indebted for the illustration in Plate VII.

The rich grazing-lands of Herefordshire are the home of one of the most unmistakable breeds of British cattle. Low writes that the Herefords "have that orange-yellow colour of the skin which distinguishes the Pembrokes and the Devons, and that medium length of horns which separates these breeds and these varieties from the race termed long-horned. It cannot be supposed that they have been kept free from intermixture with the long-horned and other varieties of the lower country, but they may be referred to that group of breeds which comprehends the Pembroke, the Devon, the Sussex, and the Glamorgan, and which some writers have proposed to term the middle-horned, a designation which distinguishes them from the long-horned on the one hand, and the short-horned on the other, but which does not sufficiently separate them from other very different varieties, as those which occupied many of the former forests of the country, and even from the older Yorkshire shorthorns."

On the other hand, some writers believe that the modern type has been developed by crossing with white-faced cattle imported from the Low Countries prior to 1671.

Although Herefords are now chiefly bred for the sake of their beef, it will be found in certain old works on agriculture that the breed, like Devons and Sussex, was chiefly valued for draught purposes.

Originally Herefords were red or brown, or even black, in colour, with no white. From that they



FIG. 1. GROUP OF HEREFORDS



FIG. 2. LONGHORN BULL

were bred to brownish or yellowish red, a few being even brindled. Grey and mottled faces then came in; but with the exception of a few greys, the modern colour is deep rich red, with white face, throat, brisket, belly, flanks, feet, and tail. These cattle are a hardy gentle breed, maturing early, with flesh of superior quality, well marbled, and heavy in the prime parts; they fatten to weights fully as heavy as any breed. The cows, however, are not abundant milkers, and in fact give but little milk. Indeed, they never were large milkers; and while a course of breeding for many generations as beef-makers has brought these cattle to such great weights and such perfect symmetry that they dispute the palm in the show-ring with the best shorthorns, this has gradually eliminated such milking properties as they may have formerly possessed.

As regards the development of the modern type of colour, Professor C. S. Plumb¹ makes the following observations: "Marshall in 1788 wrote that the prevailing colour was red with a bald (=white) face. In time a wider range of colour crept in, so that in 1845, when Eyton published the first herd-book, he grouped Herefords into four classes, namely, mottled-faced, light grey, dark grey, and red with white face. Twenty-five years later, however, all the colours but the last were practically extinct."

As regards weight, Herefords are some of the heaviest of all domesticated cattle, one bull being reported to have weighed 3640 lb.

Herefords appear to have been first introduced into the United States in 1817, when three head

¹ *Types and Breeds of Farm Animals*, Boston and New York, 1906, p. 201.

reached Kentucky, others following about 1825 and again in 1840. Throughout America the breed is much esteemed, and more especially in Argentina, where very high prices have been paid for bulls, with the object of improving the native stock. In the frequent tendency to a downward direction of their horns, Devon cattle show an approach to the long-horns; and the skull is remarkable for a prominence between the bases of the horns, which do not arise from the extreme vertex.

Less important than the Hereford is the Glamorgan breed, which inhabits a tract of country on the Bristol Channel differing to a considerable extent in its vegetable products from the mountainous districts of Wales. In place of the black of the Pembrokes, the colour of the coat approximates to the red of the Devons, the skin generally having the same orange-yellow tint so conspicuous in those two breeds. Low remarks that the peculiarities of the Glamorgan breed have been attributed to the introduction of foreign cattle in Norman times, but adds that the upper classes of that period were too busy with fighting and squabbling to be able to pay attention to such peaceful occupations as cattle-breeding.

In the plains Glamorgan cattle run larger than in the hills; but even those from the former are inferior in size and weight to Devons and Herefords, although they belong to the larger type of cattle. "Their horns," writes Low, "are small, fine, and pointing somewhat upwards; and in the breed of the hills have yet more of the upright curvature. The skin is generally orange-yellow, and the individuals are most esteemed in which this colour

prevails. The hair is dark (reddish) brown, usually broken with white; and very generally there is a uniform marking of the latter colour, extending along the belly, and forming a streak along the back. Their chests are well formed, with moderate dewlaps, and their beef is excellently marbled. The cows are exceedingly good milkers, giving a rich yellow cream. . . . In this respect the cows of Glamorgan differ essentially from those of Hereford and North Devon, in which the attention of the breeders has been directed to grazing, and not to the dairy."

In its retention of the primitive white dorsal streak the Glamorgan breed appears to show evidence of more or less direct descent from the aurochs.

This same white dorsal streak was invariably present in the old type of longhorn, as it sometimes is in the modern form. The fact that remains of longhorns have been dug up in ditches of mediaeval age in Cambridge is one of many pieces of evidence as to the antiquity of this rapidly waning breed. The old longhorns appear to have been a western type, extending over nearly all the plains of Ireland and parts of the mountain districts, while in England their range reached from Lancashire northwards into Cumberland and Westmorland, and southwards through Cheshire and Shropshire to the Severn district and parts of Somersetshire, whence it extended through the Midlands to Leicestershire and Derbyshire. One of the last herds was kept at Hardendale, in Westmorland, but there were others a few years ago in the Isle of Man and in Norfolk. The prevailing colour of the old breed was black and reddish brown, with more or less white on the body, and invariably the

aforsaid white streak along the middle line of the back. The skin was dark and thick, with an abundant coat of hair. The long horns, from which the breed takes its name, inclined outwards and downwards, although on the eastern limits of the range of the breed they are stated to have shown a tendency to an upward direction. The cows yielded good, although not abundant, milk; and the oxen, though sluggish in their movements, were "strong to labour." These old longhorns were also of a hardy disposition, but had the disadvantage that they were late in reaching maturity, this being doubtless one of the reasons why the breed fell into disfavour.

A profound difference was effected in the shape of the horns by what is known as the Gisburne cross, which took place in 1859.¹ As the result of this, the horns assumed a much more downwardly-directed and curved shape, their tips inclining inwards to such an extent as in some cases to nearly meet a few inches below the eyes. A head and a skull of these modern longhorns are exhibited in the Natural History branch of the British Museum, the latter of which shows the convexity of the upper border of the forehead characteristic of the breed, this and the downward direction of the horns causing the skull to approximate to that of a buffalo. Some years ago longhorn cattle, as already mentioned, were almost an expiring breed, but recently attempts have been made to revive it. One of the most notable modern herds is that of Mr. W. Hanson

¹ *Vide* Oldham, *The Zoologist*, vol. xv., March 1891; and Hedger Wallace, *Trans. Nat. Hist. Soc. Glasgow*, ser. ii. vol. v. p. 240, 1899.

Sale, of Arden Hill, Atherstone. These modern longhorns are not only an extremely picturesque type of cattle, but are excellent both for the butcher and for dairy purposes. They are also valued for crossing, as an infusion of their blood is stated to infuse stamina into other breeds. Not infrequently, as in the head in the British Museum, the colour is strawberry-roan.

The affinity of the longhorns to the extinct Chartley park-cattle, and thus to the white Pembrokes, has been already noticed.

As the longhorn is an ancient breed largely characteristic of the north-western districts and now decadent, so its antithesis, the modern shorthorn, is a breed of comparatively recent origin, whose original home was in the north-east of England, in the counties of Durham, Northumberland, and York, although it has now spread over nearly the whole of England, and is essentially a dominant type, not only in the British Island, but almost throughout the civilised countries of the world.

It has been asserted that cattle of a shorthorn type were bred on the Yorkshire estates of the Dukes of Northumberland at least so early as the close of the sixteenth century; and it is known that at a later period black cattle with relatively short horns were prevalent in Yorkshire, while in Lincolnshire these were replaced by a strain in which white, red, and roan were prevalent. By the early part of the eighteenth century two types or strains of shorthorns, the one known as the Teeswater, and the other as the Holderness, the latter prevailing in the south-eastern districts of Yorkshire, had been developed. About half a century later Michael

Dobinson in Durham and Sir William St. Quintin in Yorkshire imported Dutch bulls from Holland, with which they crossed their shorthorn herds; and so much did this cross alter the breed, that for a time the cattle thus produced became locally known as Dutch or Holstein. The greatest improvement in the breed was, however, made about the year 1780 by four breeders respectively named Charles Colling (1750–1836), his brother Robert Colling (1749–1820), Thomas Bates (1775–1849), and Thomas Booth (*circa* 1790), the work of the last being continued by his two sons, John and Richard. To these and other breeders we owe the modern Durham and Yorkshire shorthorns, of which two strains are still known respectively as the Booth and the Bates types.

Speaking generally, it may be said that shorthorns conform to the “beef-type” of cattle, for which they are specially fitted by their early maturity; but those of the Bates strain may be included in the “general purposes” type. Cows weigh about 1400 lb. on the average, while bulls turn the scale at from 1800 to 2000 lb., or even considerably more. In both sexes the horns are relatively small; in cows their shape is somewhat variable, but they should curve forwards, with a more or less inwards and upwards direction at the tips. A waxy yellow throughout is preferred, although the tips are frequently black. The lean and well-shaped head should terminate in a broad and flesh-coloured muzzle with large and open nostrils. Among other features, it must suffice to mention the length of the limbs, this being specially noticeable in the original Bates strain. The colour may be red, red and white,



FIG. 1. SHORTHORN BULL



FIG. 2. AYRSHIRE BULL

white, or strawberry-roan, the last of these being specially characteristic, and often termed "the short-horn colour." In bulls the horns are shorter, stouter, and less curved than those of cows. The softness of the skin, the fineness of the short coat, and the slenderness of the bones are special features of shorthorns, which rank in the first class in the estimation of the butcher.

Shorthorns were imported into the United States in 1783, when a consignment was received in Virginia. Others arrived in 1792, and again in 1812, but pedigree bulls were not received till 1817. The breed is the one most highly esteemed in the United States; and it is also abundant in Argentina, Australia, and, to a less degree, South Africa. In hardiness shorthorns are not the equals of Herefords or Galloways.

Lincolnshire red shorthorns may be regarded as a modern sub-breed, raised in the county from which they take their name. They should be wholly red, with the exception of a white tail-tuft. Of late years this strain has come into favour abroad; and in the year ending on 1st October 1910 thirty-six bulls and thirty-one cows and heifers were exported to South Africa, South America, Australia, and New Zealand.

As a breed of comparatively small importance, a very brief notice will serve in the case of the so-called Falkland cattle of Fifeshire, which take their name from the domain of Falkland, in the lower part of the vale of Eden. Of these cattle Low wrote as follows:—

"The existing cattle of Fifeshire do not really form a breed or family. They are rather a mixture of breeds, the members of which are not so amalgamated

with one another as to present a uniform class of characters. Some have horns, and some are destitute of horns; and, for the most part, they are of coarse, angular form. The prevailing colour is white, or black mixed with white. They are hardy, and subsist well on indifferent food; and the cows are usually good milkers. Like all the cattle of the lower country termed home-breds, they are slow in arriving at maturity, but the muscular substance is well mixed with the fatty; and as they produce a good proportion of internal fat, they are valued by the butchers in the markets to which they are carried."

With the Ayrshire, a native of that portion of south-western Scotland from which it takes its name, we reach the second purely British breed reared solely for the purposes of the dairy, the other being the Kerry. In its present form the Ayrshire appears to be a breed of comparatively modern origin, as it is not even mentioned by Culley in his work on Live Stock, published in 1786; and there is likewise evidence that it is one with a very complex origin, that is to say, it has been the result of numerous crosses. In 1825 the cattle of the Ayrshire district were described as being a puny, ill-shaped type, for the most part black in colour, with more or less white on the face, back, and flanks. Five-and-fifty years before that date they had, however, been crossed with shorthorn or other stock from Teeswater; while a further cross of uncertain nature is stated to have taken place in 1805, some writers affirming that a shorthorn and Jersey or Alderney cross was employed at an early date in the improvement of the breed. Again, it appears certain that a fine herd of Ayr-

shires was crossed with the West Highland breed in or about the year 1818; while Devon and Hereford crosses are stated to have been resorted to by other breeders. About the year 1780 the original black and white colouring seems to have been exchanged for red and white, this being replaced a few years later by brown and white, although in 1810 it once more regained favour.

Ayrshire cattle are of medium size, with somewhat more tendency to flesh than certain other dairy breeds. Their colours include red, brown, and white in varying proportions, some being almost or completely red, others brown and white, and yet others white and red. The whitish horns are black at the tips, curve upwards and outwards, and generally, but more especially in cows, show a backward turn at their extremities. Their size depends to a large extent on local taste and fashion. The depth of the body is considerable in many animals, with a proportionate shortness of limb. A home-bred Ayrshire cow should average about 1000 lb. in weight, and should yield about twelve quarts of milk—of average quality—daily.

Ayrshires appear to have been first introduced into America early in the nineteenth century by Scottish farmers who settled in Canada.

The last breed which can by courtesy be ranked as British is that of the Channel Islands; but these cattle can only be called British in the sense that they are reared in territory forming a portion of the United Kingdom, for in all their characters, especially the presence of pale fawn or dun and silver-grey, they differ essentially from the breeds of the British

Islands properly so called, and thereby conform to Continental types. As regards origin, it has been suggested that these cattle came from a Scandinavian stock, but in view of their marked approximation to the type of the Spanish fighting bull, the opinion of Professor Plumb¹ that they are descended from cattle inhabiting that portion of the Continent nearest to the Channel Islands, namely, Brittany and Normandy, seems much more probable. On this point the author just cited writes as follows:—

“While the cattle of those regions [Brittany and Normandy] to-day do not closely resemble the Jersey, they have some things in common. The fawn or white colour has been attributed to certain cattle of Normandy, while the blacker colour has been ascribed to the Brittany cattle, it being assumed that the Jersey has resulted from the fusing of these French types.”

Three of the Channel Islands, namely, Jersey, Guernsey, and Alderney, possess sub-breeds of their own; but those of the first two are practically identical, whereas the Jersey, which is the one generally favoured in Great Britain, is markedly distinct. The peculiarly graceful and high-bred appearance of these beautiful cattle, coupled with their prevalent colour, renders them recognisable at a glance. They are all of the same general type, although the Jersey specially excels in the high quality and large amount of milk yielded by the cows. The one disadvantage of this strain, in addition to its delicate constitution, is that it is absolutely useless for the butcher, so that bull calves, with the exception of such as are required for breeding purposes, are

¹ *Types and Breeds of Farm Animals*, p. 249.



FIG. 1. JERSEY BULL



FIG. 2. DUTCH BULL

almost valueless. The Guernsey is, however, rather more of a beef-producing animal.

Shape and make, as apart from colour, are the main points by which Jerseys are judged. The lean head should be relatively short, with the face somewhat concave, great width between the eyes and the muzzle, and the lower jaw deep and stout. In bulls the horns should be short, strong, and with a forward, upward, and slightly inward curvature, those of the cows being thinner, and generally longer and more curved. White or amber, with a black tip, is the proper colour for the horns. The thin skin is elastic and supple, and covered with an abundant coat of soft, short hair; while its secretions should be yellow. As regards colour, this is generally some shade of fawn, varying in tint from yellowish through reddish, greyish, and brownish to silver-grey; orange or lemon fawn forms one extreme of colour, while another is commonly known as mulberry black. Although whole-coloured animals are preferred, a larger or smaller mixture of white is by no means uncommon, and does not constitute a disqualification. Brindle is, however, disliked. The hair round the eyes and muzzle should be pale cream-colour or greyish. Importance is, however, attached by breeders to the colour of the tongue and tail-tuft, which in each case may be either black or white. Among other points of this breed, it must suffice to refer to the large size of the milk-veins of the cows, which should take a tortuous course, and swell out at intervals into large expansions.

The cattle of Guernsey are larger in size and less slim and elegant in build than those of Jersey; while their usual colour is yellowish, brownish, or reddish

fawn, frequently, in the case of the reddish phase, associated with a larger or smaller amount of white, especially on the limbs and under-parts. Round the muzzle (which should be either buff or flesh-coloured) and eyes the hair is usually whitish or yellowish. The hoofs ought to be of an amber tint, more or less nearly resembling that of the horns. In constitution Guernseys are less delicate than Jerseys; and, as already mentioned, they are somewhat less exclusively of the dairy type.

Both Jerseys and Guernseys (Alderneys) were first introduced into America in the year 1818, when consignments of both were received in Pennsylvania. For a long period special laws have been in force in Jersey for maintaining the purity of the breed of cattle.

CHAPTER VI

MODERN CONTINENTAL CATTLE AND THE ANCIENT BREEDS OF THE MEDITERRANEAN COUNTRIES

THE breeds and sub-breeds of domesticated cattle of different parts of the European continent are so numerous, and in many cases so ill-defined, that in this volume it is possible to mention only some of the more important and best-known types.

In the preceding chapter it has been mentioned that the cattle of Brittany and Normandy approximate to the Channel Islands type; and this notice must suffice for these breeds.

It was also mentioned in the same chapter that white, whitish grey, or greyish white, and frequently polled, cattle are common in parts of Scandinavia, especially in the mountainous districts of northern Sweden, where they are represented by the *fjäll* breed. According to Professor Sundbärg,¹ this breed, which is often marked with black spots on a white ground, is the oldest in the country, and is known to have been in existence towards the close of the thirteenth century. At an unknown date reddish yellow-horned cattle of larger size were introduced, which in the north invaded much of the territory occupied by the

¹ *Sweden, its Population and its Industries*, 1904.

ancient breed. This horned breed has, however, itself been largely altered by crossing, but still survives in the island of Gothland.

In Norway, according to Professor Isaachsen, several breeds are known to have been in existence at the end of the sixteenth century. In the western and south-western districts, for instance, the cattle are either horned or polled—apparently in about equal numbers—and vary in colour from black to grey, red, or dun, being in some cases whole-coloured, but in others marked with white patches or spots. In the south-eastern districts, on the other hand, the indigenous cattle are invariably polled and red. Another type occurs in the eastern valleys of Esterdalen and Gudbrandsdalen, where the colour is generally black or dun, although in some cases red, while horns are developed in the great majority. The western breed is believed to be very ancient. Passing from Scandinavia to the Low Countries, a well-known and characteristic breed is the one commonly bearing the name of Dutch cattle, although termed in America the Holstein-Friesian, the latter title referring to the fact that while the head-quarters of the breed is in the Dutch province of Friesland, it is represented in the German province of Holstein. In general appearance and colouring these cattle seem to present a considerable resemblance to the old black-and-white Ayrshire breed, with which they also agree in being mainly reared for dairy purposes. Years ago Dutch cattle were regarded by Dr. Fitzinger as the direct descendants of the aurochs; and this opinion is supported not only by the great antiquity of the breed, but likewise by the frequent presence of a white line along the middle of the back, and the

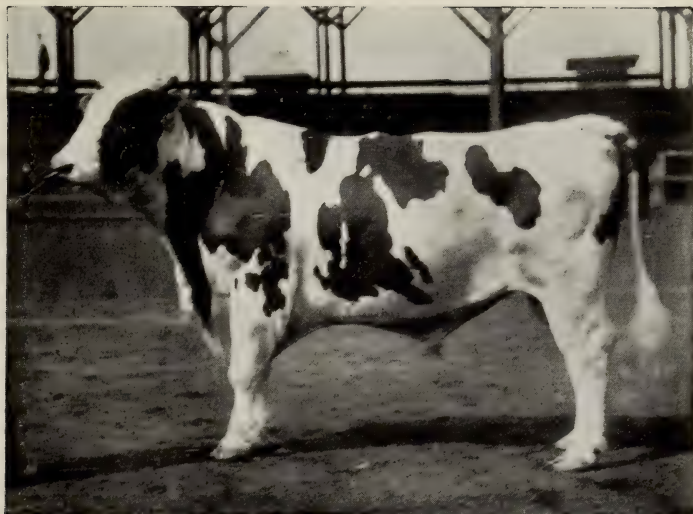


FIG. 1. DUTCH (HOLSTEIN-FRIESIAN) BULL

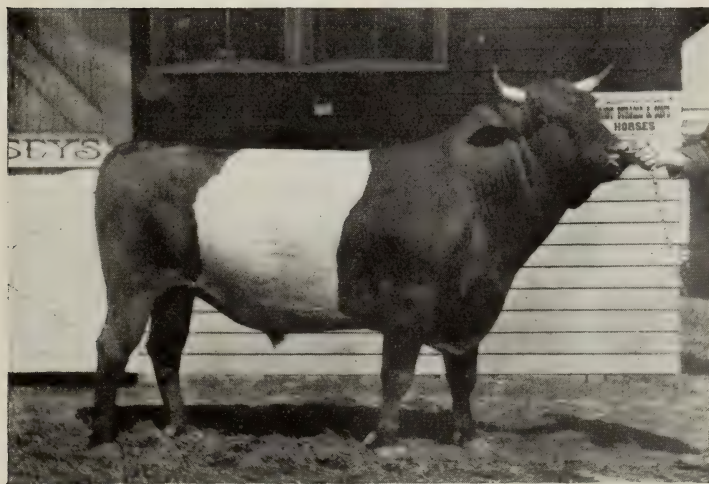


FIG. 2. DUTCH BELTED BULL

prevalence of black elsewhere. Black and white is the invariable colouring; and in connection with this it may be noticed how the white areas tend to arrange themselves along the lines of the limbs, extending in the front pair as high up as the shoulder-blade, and in the hind-quarters to the pelvis. This, however, is a feature of frequent occurrence in albinistic animals. Red may, however, in some instances replace the black; and in certain parts of Holland red and white is maintained as the colour of particular herds. In size these cattle run very large.

Although the breed appears to be unknown in England, it meets with considerable favour in the United States, where it was introduced—notably in the neighbourhood of New York—by the early Dutch settlers. Black and white is the colour of the American herds.

Denmark has two chief breeds of cattle, namely, the Jutland, confined to the mainland, and the red Danish, which is indigenous to the islands, such as Funen and Zealand, but also occurs in southern Jutland. The Jutland breed is usually black and white, but occasionally grey and white, its colour and general appearance suggesting affinity with the Holstein-Friesian stock, although there is no historical evidence of its origin. As its name implies, the red Danish is wholly red in colour; it appears to be a cross between the native stock of the islands and the Angler (from Angeln in Schleswig) and other cattle imported from Schleswig. The red Danish was always a dairy breed, and of late years the Jutland cattle, which were formerly a beef-stock, have been modified for the same purpose. A full account of Danish cattle is given by Professor Rasmussen in

Bulletin No. 129 of the Bureau of Animal Industry,
U.S. Department of Agriculture, 1911.

Another and very remarkable breed of cattle, which has been introduced from Holland into the United States, is the one commonly known as the Dutch belted, but termed in its native country the lakenfeld, from *lauken*, a blanket, or sheet, in allusion to the broad belt of white which encircles the middle of the body. Apart from this white band, which varies from a foot to thirty inches in width, these cattle are wholly black. The breed, which dates back to at least the seventeenth century, is smaller than the ordinary Dutch, from which, however, it has probably been derived by careful selection. On account of this inferiority in size, it is more like the Ayrshire in general appearance. It is noteworthy that in their general type of colouring belted cattle recall the black-and-white breed of Dutch rabbits; and it seems probable that both were evolved by selection to meet a special fashion. Herds of these belted cattle were formerly maintained by many of the Dutch nobility.

Belgium possesses several types of cattle, although most of these do not appear to have attained the rank of well-established breeds. Exclusive of mixed types containing an admixture of shorthorn and Dutch blood (the latter of which is prevalent in the neighbourhood of Namur) six breeds are now recognised, in most of which the bulls are small, and lack straightness of back. All are of the milking type.

The first type comprises the Belgian breed proper, and possesses two divisions, the first coming from Hainaut, La Hesbage, and the second from East

and West Flanders and the Province of Antwerp. There is much variation in colour, blue-grey being most numerous, but many examples are pied red, white, black and white, and even roan. The hair is short, and the skin in the case of white individuals shows through, giving a flesh-coloured pinkish appearance. The second type comprises the race du Coudron, which includes the environs of Namur. Here the shortness of the head indicates shorthorn blood. The colour varies enormously, blue-pied, red-pied, black-pied being common, though the predominant shade is blue. The race du Pays de Herve, the third type, is smaller, and nearly always black and white, which as the country lies on the frontier of Germany indicates an infusion of foreign blood. The race Ardennaise, the fourth type, does not differ greatly from the preceding, though there is greater variety of colour. In the race Campine, which comes from a sandy and poor soil, the prevalent colour is red or light brown. These cattle are small and slight, scarcely bigger than Jerseys, but by no means so neatly built, the head being rather clumsy. The sixth, or Flanders, type possesses distinct features. The colour is reddish brown, mostly dark, with occasional light brown. Out of fifty-six contributed by Flanders to a show in 1910, there were only four exceptions to this red-brown colour, two being spotted on the head with white, one red-roan, and the other red-pied. A bull stood over five feet at the withers, and was not unlike the Welsh bull in general appearance.

Among the breeds of France and Germany it must suffice to allude to the Vosges cattle of Alsace-Lorraine, the remarkable peculiarities of which have

been pointed out by Dr. Max Hilzheimer,¹ who states that these cattle are of medium size, with a median white stripe, expanding into a patch on the rump, a similar streak on the under surface of the body, and a white tail. The neck and sides of the body are mostly black, the dark colour being sharply, although irregularly, defined from the black. The face is generally white, with black spots, and black patches round the eyes; but may be black with a white forehead, although never wholly black. Very generally the limbs are white above and black below on their outer surfaces. A characteristic feature of these cattle is the presence of black spots or patches on the white areas. The muzzle, eyelids, hoofs, and horns are black, the former being rather long and directed forwards, with the tip-to-tip forming the widest span. The forehead is broader than long, and sharply distinguished from the lower part of the face: in bulls the forehead is rather longer than the lower part of the face, but in cows the two are equal. Between the eyes is a hollow, almost deep enough to contain the closed fist. In some individuals the general colour is blackish red, with the dorsal streak yellowish red.

These cattle belong to a short-headed type—which is common among German and French breeds—and thereby differ markedly from the breeds with a long forehead. The dark spots and patches on the white areas are a feature common to the above-mentioned Dutch and South German cattle, as is also the white dorsal streak. In the opinion of Dr. Hilzheimer, the Vosges cattle represent an ancient indigenous breed, which formerly had a much wider range. There is,

¹ "Das Vogesenrind und das Schlettstadter Pferd," *Mitt. Philom. Ges. Elsass-Lothringen*, vol. iii. p. 368, 1906.



FIG. 1. VOSGES BULL



FIG. 2. VOSGES COW

however, a theory that the breed was brought to the Vosges by Swiss during the Thirty Years War. The white dorsal streak and the general black colour are clearly indicative of aurochs-descent.

Switzerland is the home of two well-known and nearly allied breeds of cattle, one of which, the brown Schwyzer, or brown Swiss, is uniformly dark-coloured, while the second, known either as the Simmenthal or the Friburg breed, is parti-coloured, the latter forming about three-fifths and the former two-fifths of Swiss cattle as a whole. Both are of great antiquity, skulls closely resembling those of the modern breeds having been obtained from the prehistoric lake-villages of Switzerland; and they are regarded as the parent stock from which other breeds or sub-breeds have been derived.

The brown breed, which has been introduced into the United States, has its head-quarters in the cantons of Schwyz, Uri, and Zug, but also ranges over most of eastern and northern Switzerland. The cattle of Algau, in Bavaria, are of essentially the same type; and the breed is also found in other parts of the Continent. The brown Swiss is essentially a mountain breed, grazing in summer on the high Alpine pasture, but in winter being kept in sheds in the valleys. These cattle are suitable either for the butcher or for the dairy. In make, the bulls are distinctly heavy, with a very deep neck and fore-quarters, and a long back. The horns are very short, whitish for the greater part of their length, but gradually darkening towards the tip. The colour may be either dark or light brown, a favourite tint being a dark mouse-colour, shading into grey along

the line of the back-bone, and in some cases also on the under-parts; while there is usually a cream-coloured ring round the muzzle, the latter being very dark. The grey dorsal streak is doubtless another case of the inheritance among domesticated cattle of the light line of the aurochs. Brown Swiss were first imported into the United States in the year 1869.

The Simmenthal, or parti-coloured, breed, also known as the Friburg, has its head-quarters in the Simmen Valley, in the canton of Friburg, and is thus a south-western type. In general appearance these cattle recall shorthorns, but have longer heads and necks, the colour being black and white, liver and white, or lemon and white.

A very different type is presented by the cattle of the Roman Campagna, which are large, silver-grey animals, with a white dorsal stripe, usually a pale ring round the eye, and a straight profile. These fine cattle are generally admitted to be related to the long-horned breeds of Hungary and Podolia; and it has been suggested that they are descended from herds brought from those countries by the Longobards about the year 600 A.D., the chief basis for this opinion being the absence of representations of Campagna cattle from the ancient Roman sculptures.

From the evidence of a fossil skull of somewhat peculiar type found in a deposit of the Stone-Bronze Age in the Italian province of Brescia, Dr. Max Hilzheimer¹ has, however, been led to conclude that the Campagna cattle are descendants of a race of the aurochs. The skull of that race already referred to

¹ "Die italienschen Haustierte," *Korrespondenz-Blatt. der Deutsch. Ges. für Anthropologie, Ethnologie und Urgeschichte*, vol. xxxix. Nos. 9-12, 1908.



FIG. 1. BROWN SWISS BULL



FIG. 2. SIMMENTHAL BULL

is proved to be of great antiquity by the fact that the bones of the forehead are pierced by a stone spear or axe head: it differs from the ordinary aurochs type by the more forward direction of the horn-cores, and the upward trend of their tips,—features in which it recalls the extinct *B. namadicus* of the gravels of the Narbada Valley, central India. The resemblance of the skulls of Campagna cattle to this Brescian aurochs is considered by Dr. Hilzheimer sufficiently close to warrant the opinion that the former constitute an indigenous Italian breed; and if this be so, their alleged absence from the old sculptures (which the writer cited is inclined in some degree to dispute) must be accounted for by some explanation other than the one mentioned above. On the other hand, if, as seems probable, these cattle are related to the Hungarian breed, their direct, unmixed descent from the aurochs is doubtful.

To the north and south the Campagna cattle are replaced by other breeds, some of which are regarded by Dr. Hilzheimer as nearly allied to what he calls the grey Alpine cattle—presumably the brown Swiss breed. Perhaps the best account of these Italian cattle is contained in a letter from Professor I. Giglioli, published by Mr. Hedger Wallace in his article on white cattle, quoted in an earlier chapter. This letter, with a few verbal alterations, is as follows:—

“In Tuscany we find five breeds of cattle, namely, the Chianina, Maremmana, Tiberina, Svizzera, and Montanina. The first three are said to be descendants of the breed called Podolico or Pugliese, from Puglia, in the south of Italy. The Svizzera came from Lugano, in Switzerland, and the Montanina are non-descript mountain cattle.

“For many centuries the Val di Chiana, in Tuscany, has been celebrated for its white cattle. The breed called Chianina, or Val di Chiana, is white, with the muzzle and the tip of the tail black, the tongue dark, the ears flesh-coloured internally, and the horns long, fine, and black-tipped.

“The Maremmana breed, which is mingled grey and white in colour, is found on the salt, marshy plains of Volterra and the clays of Sienna; it is a working breed. The Tiberina breed differs but little from the last; while the Svizzera breed, which is black, occurs only in the neighbourhood of Pisa. In Venetia, the seaboard and alpine province of Udine, the ancient Friuli, the cattle are a mixture of all the neighbouring breeds—Tyrolese, Styrian, Carinthian, and Belanese—grafted on the local stock known as Friulance, which is itself one of the numerous varieties of a breed that now predominates in every part of Italy.

“This is the typical breed of south-eastern Europe, which has two subdivisions, firstly, the Hungarian-Transylvanian, and, secondly, the Podolian-Moldere. Tyrolese oxen are first brought while young into the province of Brescia, in Lombardy, and thence distributed over the plains under the name of Brescian oxen. They are tall and white-skinned, the best coming from Merano and Lana, in the Tyrol. Oxen are also brought from Emilia into the provinces of Cremona and Mantua; but those of the Tyrol are preferred.

“In northern Italy there is the Piedmontese or Carmagnola breed—tall of stature, short-horned, and greyish red in colour. Emilia, or its northern part, about Piacenza, has a specific type, called



FIG. 1. SKULL AND HORNS OF SPANISH DRAUGHT OX



FIG. 2. SKULL AND HORNS OF NGAMI OX

Bardigiana, in colour red or mottled with white, and long-horned.

"In the plain towards Parma is found the Reggiana or Parmense breed. These cattle are regarded as the type of the large races bred on the central plains of Europe, but the uniformity of their red coat, without marks, and the thick, short-limbed body, are considered proof of their antiquity. Italian zoologists assert that it is descended from the ancient *bue italico*. In the Udine province, and in parts of Parma and Piacenza, there is a breed with a uniform coat of red or reddish brown, amber-coloured horns and hoofs, rose-tinted lip and nostrils, and white eyelids, these also being regarded as the relics of an aboriginal race.

"South of the Jaro, and extending beyond Bologna, is the Pugliese breed, which is almost restricted to the province of Verona. The province of Belluno gives its name to the Bellunese breed, which resembles the Tyrolese in its short curved horns, uniform colour, but in place of being tawny and whitish is decidedly grey.

"In the province of Treviso there is a medley of sub-breeds, all variations of the Podolian; while in the province of Vincenza the Podolian about equals the other types, the Podolian being the sole breed in the rest of Italy south of the Po.

"Piedmont possesses a pure breed, called Pianura, the colour of the Piedmontese and mixed breeds being light grey. The mountain breed already referred to may be brown, black, or white-spotted."

In connection with the foregoing it is important to mention that on page 15 of his already quoted paper on the more important breeds of British

cattle Professor Hughes figures the skulls of a Piedmont and a Chillingham bull in the collection of the British Museum, and states that if compared, "we shall find them to be almost identical." This statement, as already pointed out in an earlier chapter, is quite indefensible; and it may be again mentioned that the two figures have been transposed.¹ Whereas in the Chillingham bull the forehead is flat and broad, and the rather long horns are slender, delicate, and directed upwards and forwards, in the Piedmontese animal (of which the entire skeleton is shown on Plate I of the present volume) the forehead is narrower and somewhat convex, the short horns are coarse and stubby in character, and are directed upwards nearly in the plane of the forehead with a somewhat outward curvature, and a backward direction of the tips, which are, however, partially worn. In fact, it would be difficult to find two much more divergent types among the cattle of western and southern Europe. In the form of the forehead and horns the Piedmontese breed shows, indeed, strong signs of affinity with humped cattle.

The aforesaid Podolian and Hungarian cattle, which range through Hungary into Turkey and south-western Asia, are represented by two strains, the one characteristic of Hungary, and the other of Transylvania. In both types the bulls have the general pale drab colour of the short coat relieved by blackish rings round the eyes, as well as by black markings on the muzzle, dewlap, and certain other parts of the head and body, and the black tail-tuft;

¹ Mr. Hedger Wallace in the paper above cited has repeated Professor Hughes's error.



FIG. 1. LONG-HORNED HUNGARIAN COW



FIG. 2. BLUE NILE HUMPED OX

while the lower portions of the legs show more or less white. In oxen and cows, on the other hand, the coat is paler — often approaching white — and whole-coloured. The horns of the bulls, which are beautifully shaped and symmetrical, are long and somewhat doubly curved, with an outward, upward, and finally backward direction; they are black towards the tips, but elsewhere greyish white. Those of cows are much more slender, with a more pronounced backward inclination at the tips. Longest of all are those of oxen, which may measure fully five feet from tip to tip. The bulls of the Hungarian strain are heavier animals, with a fuller dewlap than those from Transylvania.

On account of their poor flesh-forming and milk-yielding qualities, these handsome cattle are being rapidly replaced in their native country by breeds of a more ordinary, but more profitable, type; and it is to be feared that, with the exception of specially preserved herds, they will disappear in course of time. The possibility, or rather probability, of these cattle having a cross of humped blood must not be overlooked, this being referred to in a later paragraph.

In the presence of a strongly marked fawn-coloured dorsal streak the otherwise black fighting bulls of Spain carry decisive evidence of their more or less direct descent from the aurochs.

Spanish cattle are represented by three more or less distinct breeds — the northern Gallego and Navarra, the central or Castilian, and the southern or Andalucian. Of these, the Gallego and Navarra type is distinguished by its generally yellowish fawn or pale chestnut colour, the large upwardly and back-

wardly directed horns, and the fine proportions of the head, body, and limbs. The Castilian breed, on the other hand, is characterised by large size and bulky shape, the straight back, the dusky and often nearly black colour, and the shapely, forwardly-directed horns. The Andalucian type is of medium size and build, with the line of the back sinuous, the colour usually dusky, although in some cases black and white, or even red and white, and the horns very similar to those of the Castilian breed. In the Andalucian and Castilian cattle the horns may be compared to the tines of a pitchfork held horizontally with the concavity upwards, whereas those of the Navarra breed may be likened to the same implement in a vertical direction with the concavity of the tines turned backwards.

The relations and history of the different types of Spanish cattle have been discussed by Dr. A. Cabrera,¹ who states that the Navarra type is represented on bronze bas-reliefs of the Celto-Iberian period, as well as on certain ancient Spanish coins. This indicates the great antiquity of the breed—an indication confirmed by representations of cattle of a more or less similar type on the ancient monuments of Italy, Greece, and Egypt.

After alluding to the theory of the origin of these cattle from the zebu, or humped cattle of south-western Asia and Africa, by the elimination of the hump as the result of careful selection, Dr. Cabrera adds that Spanish and other south European cattle of this type are evidently of eastern origin, and were introduced into Spain in the domesticated condition.

¹ "Sobre el origen de las razas bovinas españoles," *Bol. R. Soc. Españ. Hist. Nat.*, 1904, p. 71.

Such a breed, he continues, introduced by the Greeks and Romans cannot but have modified and absorbed the indigenous Spanish cattle, and it is suggested that the uniform colour of the cattle of northern Spain is due to a Græco-Roman importation. It is known that fawn or chestnut was specially favoured by the ancient Romans in their cattle, and it is this colour which is most prevalent among the cattle of Gallego and Navarra. Nevertheless, there are a certain number of white cattle which may be the descendants of the Roman sacrificial breed.

The existence of the large-horned and light-coloured breed of cattle in the Peninsula during Celto-Iberian times being proved, the author proceeds to demonstrate the presence, at the same epoch, of autochthonous cattle resembling the modern Castilian and Andalucian breeds. The most important piece of evidence is the "stone of Clunia," which was in existence in Peñalva in 1774, but subsequently destroyed. On this Celto-Iberian monument was represented a bull-fighter, in full array, prepared to receive the charge of a bull, while the legend is the ancient equivalent for a bull-fight.

In this monument (unlike those of the same period already referred to) the bull is represented with horizontally-directed horns of the type of those of the Castilian and Andalucian breeds and also of the aurochs. Whether the animal depicted was a wild bull (the aurochs probably existing at this date in Spain as in many other parts of Europe) or a domesticated individual cannot be definitely determined; but it indicates the existence in the Celto-Iberian epoch of cattle with the aurochs-type of horns. In accord with this is the close resemblance of the modern

Spanish cattle of the Castilian breeds to the aurochs. Not only have the horns the same general form and direction, but the black hue of the modern breeds is the same as that of their extinct relative; while more important still is the fact that Castilian bulls show, as already mentioned, a fawn-coloured line down the middle of the back.

It is accordingly concluded that, while the cattle of central Spain are the direct descendants of the wild aurochs, the southern or Andalucian breeds seem, on the other hand, to have been crossed with cattle imported by the Arabs, which would account for their inferior size and frequently piebald colouring. The difference in size between the large Gallego and the small Navarra cattle of the northern type may be largely due to the mountain habitat of the latter. The Castilian and Andalucian bulls and those of the Navarra breed of the northern type are employed in the ring, while the large Gallego cattle are those used for draught and agriculture.

The affiliation of the black Castilian, and in a less degree the Andalucian, breeds of Spanish cattle to the wild aurochs tends to strengthen the opinion as to the existence of an intimate relationship between ancient Welsh and Irish breeds, like the Pembroke and Kerry, and the latter.

The next point for consideration is the aforesaid theory that the large-horned and dun-coloured northern Spanish breed of cattle, together with the large, light-coloured cattle of Greece, Italy, and certain other parts of southern Europe, are descended from the zebu. The horns of all humped cattle—both Indian and African—differ from those of the aurochs and the related types of European domesticated

cattle by their distinctly lyrate shape, the first main curve having the convexity in front instead of behind. Their tendency is also to grow upwards and backwards, rather than forwards, and they may be, as in the Galla cattle, very large. Other characteristics of the zebu are to be found in the large dewlap, and the white rings round the eyes and fetlocks, the light fetlock-rings being remarkably constant in all the half-breeds so common in northern India. Now, Spanish draught cattle of the Gallego breed not only exhibit an approximation to the zebu, and especially to the Galla, type, in the direction, curvature, and size of the horns, but also show a similar large dewlap, and light rings round the eyes and the fetlocks. The horns of the large whitish Italian cattle also approximate, especially in direction, to the same type; and to a certain extent a similar feature is noticeable in the horns of the large pale-coloured Podolian and Hungarian cattle, breeds which also have large dewlaps, and, despite their light colour, traces of white rings round the eyes and fetlocks.

The foregoing features observable in the north Spanish and other light-coloured south European cattle are those which might be expected to be retained in breeds descended from the zebu, which have been so altered by selection and crossing, probably with the indigenous cattle of Europe, as to have lost all trace of the hump.

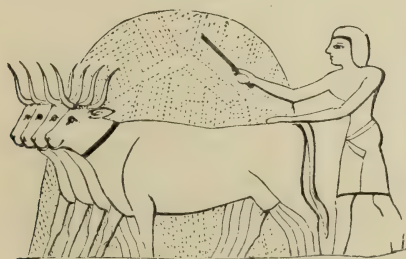
The theory that Spanish draught cattle have a strain of zebu-blood in their veins receives support from the circumstance that there appear to be two fundamentally different types of European cattle. On the one side are the breeds of the aurochs-type,

such as the Castilian, Andalucian, Jersey, Pembroke, West Highland, and white park-cattle, which trace their origin more or less directly, in my opinion, to *B. taurus primigenius*, and, except for albinism, are for the most part black, red, or tawny in colour, while the forehead of the skull is flat, the dewlap is small, and the horns are singly-curved, with a more or less forward direction, especially at the tips, which, with rare individual exceptions, show no backward inclination. On the other side are the long-horned north Spanish, Italian, Grecian, and Hungarian breeds, whose colour is very generally pale chestnut, drab, silver-grey, or creamy white, often with light rings round the eyes and fetlocks, while the dewlap is large, the forehead of the skull often convex, and the tips of the doubly-curved horns show a distinct backward direction. This type must almost certainly have had an origin distinct from that of the first group, and since it approximates in the features already enumerated to the zebu type, while the zebu itself has existed in Mesopotamia from Assyrian times,¹ nothing is more probable than a zebu ancestry for the cattle in question. This view of the zebu-origin of the long-horned cattle of Spain is strongly supported by Dr. Dürst,² who is of opinion that the long-horned cattle of ancient Egypt belong to the same stock, as is indicated by the form of their horns and skull. These long-horned cattle of ancient Egypt—of which the British Museum possesses a skull and horns dating from about 3500 B.C.—were humpless, as is shown in the annexed figure of a yoke of oxen threshing corn, and likewise in the

¹ Dürst, *Die Rinder von Babylonien, Assyrien, und Ägypten*, p. 15.

² *Op. cit.* p. 72.

representation of an ox led by two men. On account of their humpless character, I at one time regarded these ancient Egyptian cattle as a distinct type; but the hump has probably been eliminated by selection. Dr. Dürst considers them to be near akin to the Indian zebu, and believes that they were introduced into Egypt from the East during the prehistoric epoch. Having been established in northern Africa, they were at a later period introduced into the Spanish Peninsula, possibly by the Phœnicians, but more probably, in the opinion of the writer last quoted,



LONG-HORNED EGYPTIAN CATTLE
THRESHING CORN

by the Arabs, who in early times had an extensive trade with Cordova.

In the slenderness and contour of their horns the ancient Egyptian cattle depart further from the African zebu type than is the case with

the Spanish long-horned breed; but this may perhaps be attributed to special selection, the fact that the ancient Egyptians possessed a polled breed tending to confirm this view. In north-western Africa there may have been a larger-horned breed.

If the long-horned Spanish cattle were imported from Africa, Europe would appear to have received its zebu-like breeds from two sources, the long-horned, light-coloured cattle of Italy and Hungary having, as already mentioned, probably come from Asia Minor.

Here it may be mentioned that the long-horned

Spanish and ancient Egyptian cattle differ from the breeds related to the aurochs in the shortness of their skulls, and certain features in the conformation and position of the eye-sockets. Too much importance must not, however, be assigned to these features, since Dr. Hilzheimer¹ has shown that the so-called Franqueiro cattle of Brazil, which are known to be derived from the long-horned Spanish breed, show a tendency to revert to the long type of skull characteristic of the aurochs group.

According to the researches of Professor Flinders Petrie and others,² the colour of the ancient Egyptian long-horned breed, although in some cases wholly red or black, was generally light with dark spots or blotches, but occasionally the reverse of this, the under-parts being nearly always light. The light ground-colour was usually pure white and the spots either black or red, or a mixture of both colours. There were, however, all gradations in the ground-colour from very light brick-red to dark reddish brown. Or, again, the prevalent colour might be light yellow, with or without red or black spots. Rarely a reddish or blackish ground marked with light or red spots is met with. The markings were not only uniformly distributed over the body, but were sometimes broken up into small stars, streaks, and dots, thereby recalling the so-called "leopard-cattle" of Nubia and Damaraland, and thus affording additional evidence of the zebu ancestry of the cattle of Pharaonic times. Another zebu-like feature of the breed is the large development of the dewlap. These long-horned cattle are believed to

¹ *Die italienischen Haustiere*, op. cit.

² *Vide* Dürst, *op. cit.* p. 41.

have died out in Egypt at an early period, when they were replaced by a short-horned breed.

This short-horned breed, which also existed in Egypt in Pharaonic times, and in some instances carried horns of only a few inches in length, was represented by two strains, the one with, and the other without, a hump. The humped type, which seems to have come originally from Syria, but may have reached Egypt from Nubia,¹ appears to have resembled the modern short-horned and humped cattle of Somaliland.

Here it is important to refer again to the origin and relations of the Celtic shorthorn, which have already been discussed in the chapter on park-cattle. In the opinion of Dr. Dürst the short-horned humped cattle of ancient Egypt and the modern breeds of Syria and Asia are nearly related to that form of the Celtic shorthorn whose remains occur in the Pfahlbauten or prehistoric lake-dwellings of Switzerland. In other words (following the lead of Professor Rütimyer, of Basle), he states that the short-horned breed of the Pfahlbauten came originally from Asia, was domesticated in times long antecedent to the Babylonian civilisation, and was derived from the zebu.²

This opinion leads, however, to great difficulties, for if, as is generally admitted, the true Celtic shorthorn is more or less nearly identical with the Pfahlbauten breed, the former must likewise be to a great extent derived from the zebu. But if the Celtic shorthorn be descended from the zebu, and is likewise, as Professor Boyd Dawkins³ and several other writers

¹ Dürst, *op. cit.* p. 73.

² *Ibid.* pp. 81-85.

³ *Quart. Journ. Geol. Soc.*, vol. xxiii. p. 184, 1867; and *Trans. North Stafford Field Club*, vol. xxxiii. p. 48, 1898-99.

maintain, the ancestor of the modern Pembroke and West Highland cattle, it is manifest that the latter must also have zebu-blood in their veins, and be, ultimately, of foreign origin, and thus, according to the view that park-cattle are direct derivatives of the aurochs (*supra*, p. 84), practically a distinct species. If, on the other hand, it be admitted, as Professor Low believes, that park-cattle are closely related to the Pembroke and Highland breeds, it follows, on the theory of the Eastern origin of the Celtic short-horn, that the former must likewise have zebu-blood. As it was admitted by Professor Rütimeyer that the Pembroke and Highland breeds are of the aurochs type, the Eastern theory lands us in confusion, unless it is considered that the Eastern aurochs, and not the zebu, was the ancestor.

In the time of the Pharaohs the Egyptians employed oxen both for ploughing and for threshing corn, the latter operation being shown in the illustration on page 135, and likewise in another fresco reproduced on page 197 of Gosse's *Monuments of Ancient Egypt* (1847), several animals being employed in each instance. Although humpless, these oxen show the lyrate type of horn distinctive of the zebu, while the one in the foreground of the aforesaid illustration in Mr. Gosse's volume exhibits the blotched type of colouring—dark blotches on a light ground—already referred to as being common among modern African cattle. In the work last quoted it is mentioned that the keeping of horned cattle was an important part of husbandry among the ancient Egyptians. "For about four months of the year they were pastured in the clover-fields, but during the remainder of the year they were kept in

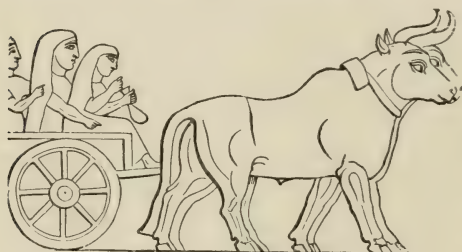
stalls, where they are often depicted, arranged, and tied to rings as in modern cattle-stables, attended by men who often feed them by hand." It is added that a large portion of the fodder of these cattle consisted of lush and succulent aquatic plants, and particularly lotus and papyrus, the sweet pulp of the latter being highly nutritious. In some of the frescoes cattle are represented feeding on the flags in the marshes of the Nile valley, while others show the harvesting of the same plants for the purpose of stall-feeding.

Mention has been made in an earlier chapter of the occurrence of the wild aurochs in Mesopotamia during the Assyrian period; and there is evidence of the existence of a long-horned domesticated breed apparently derived from that species at the same epoch. The best evidence of this is derived from a carving in ivory found in the north-west palace of Assurnassirpal, at Nimroud, dating from about 880 to 860 B.C.¹ It represents the head of a cow, and shows the characteristic long, conical head of the aurochs type, with the eyes directed somewhat forwards. The horns, too, are essentially aurochs-like, being about as long as the head, and directed at first outwards, then forwards, and finally again outwards. As further evidence of the existence of the same type is afforded by Dr. H. Schliemann's researches in Hissarlik, it seems practically certain that the aurochs was domesticated in Asia Minor.

In addition to these aurochs-like tame cattle in Mesopotamia, there were others in the time of Sennacherib (704-681 B.C.) identical with the long-horned type of zebu, as is well shown in the annexed

¹ See Dürst, *op. cit.* p. 12, pl. i. fig. 1.

illustration. In the contour of the neck and shoulders as well as in the direction of the horns, the representations of these humped cattle differ widely from those apparently representing the aurochs (*supra*, p. 64). That these long-horned cattle did not come from Egypt is demonstrated by the presence of the well-developed hump, but the horns are of the Egyptian type.¹ Zebu, as already mentioned, still occur in parts of Mesopotamia, but mostly of the short-horned type, although long-horned animals are sometimes seen. Like the Egyptians in the time of the



ASSYRIAN HUMPED CATTLE DRAWING
A CART.

Pharaohs, the ancient Babylonians possessed a humpless and a humped type of short-horned cattle,² while Assyria, Syria, and Asia Minor generally have been since

very ancient times the home of various types of short-horned cattle more or less nearly related to the zebu. These cattle are, however, undoubtedly of very mixed origin, as is evident from the fact that, on his return from his conquests in Palestine and Arabia, Tiglath-Pileser brought home 20,000 head of captured cattle in his train, while after a war in northern Syria he returned with another 1500.³ It, therefore, seems unprofitable to further discuss the nature and origin

¹ *Ibid.* p. 15.

² Dürst, *loc. cit.*

³ See G. Smith, *Assyrian Discoveries*, pp. 281-284; and Dürst, *op. cit.* p. 17.

of cattle of such an extremely mixed type. In regard to the domesticated cattle of Biblical times, I may make the following extracts from an article contributed by myself to Murray's *Dictionary of the Bible*:—

“In ancient Hebrew, as in modern English, several terms were used to designate domesticated cattle, according to sex, age, etc. Although each appears to have had a more or less definite meaning, they are frequently translated indifferently in the Authorised Version as bull, cow, ox, bullock, heifer, calf, etc. Among the more important of these terms, *bâkâr* (derived from a root signifying to cleave, and hence to plough) seems to be properly used for adult cattle of either sex, especially those suitable for ploughing. It is translated bullock in Isaiah, chap. lxv. v. 25, cow in Ezekiel, chap. iv. v. 15, and oxen in Genesis, chap. xii. v. 16. *Shôr*, although occasionally used collectively, denotes a single individual, whether bull, cow, ox, or calf. Its Chaldee equivalent *tôr* (from the same root as the Greek *tauros* and the English *steer*) occurs in the later books of the Old Testament. *Par*, bull, and *parah*, cow, are generally used respectively for a young bull or bullock, and for a heifer or young cow used for sacrifice. In Judges, chap. vi. v. 25, however, *par* may signify a much older bull. Another term for a heifer is *aigleh*, which occurs in Hosea, chap. iv. v. 16. *Aigel*, or *égel*, on the other hand, denotes a calf of either sex, properly of the first year, although it may be used occasionally for older animals. Finally, the word *abirim* (*the strong ones*) is used in a few passages for bulls, as in Psalm xxii. v. 12. No animals in the rural economy of the Israelites were held in higher esteem than cattle, on whose labours depended the ordinary operations of farming.

Oxen were used for ploughing, for treading out corn, for draught purposes, when they were generally yoked in pairs, and as beasts of burden. Their flesh was eaten, they were used in the sacrifices, and the cows supplied milk, butter, etc.

"It seems clear from Proverbs, chap. xv. v. 17, and 1 Kings, chap. iv. v. 23, that cattle were sometimes stall-fed, though this was probably not the rule. Humped cattle, or zebu, were kept in Syria, where there were also breeds of ordinary humpless cattle, one of which was 'polled,' or hornless. The long-horned humpless cattle of ancient Egypt have been referred to a distinct species by myself under the name of *Bos ægyptiacus*. The domesticated Indian buffalo, now commonly used in Syria and Palestine for ploughing, etc., appears to have been unknown there in early Biblical times."

These cattle doubtless belonged to the aforesaid partly humped and partly humpless nondescript breeds of Syria generally.

Leaving the cattle of Europe and the eastern and southern Mediterranean countries, attention may be directed for a short space to the humpless breeds which have been introduced from Europe into various parts of the world, where they have reverted, in greater or less degree, to a semi-wild condition; and likewise to an altogether peculiar South American breed.

In his *Histoire Naturelle des Quadrupeds de Paraguay*,¹ published in Paris in 1801, Don Felix d'Azara stated that at that time there were half-wild cattle on the pampas which had assumed a nearly uniform brown colour; and Darwin² quotes the *Times* of

¹ Vol. ii. p. 361.

² *Animals and Plants under Domestication*, vol. i. p. 89.

18th February 1846, to the effect that a similar tint characterised the cattle then to be found in a practically wild state in Texas. On the other hand, the cattle seen by Lord Anson in 1741 in the Ladrone, or Marianne, Islands, to the north of New Guinea, were described as "milk-white, except their ears, which are generally black."¹ At the date referred to, these wild cattle were estimated to number about ten thousand head. Cattle were introduced into the Falkland Islands from La Plata by the French in 1764, and in 1833-34, when Darwin visited these islands, their descendants were very numerous and thoroughly wild. "In the southern districts," writes Darwin,² "the animals are mostly white, with their feet, or whole heads, or only their ears black; but my informant, Admiral (Sir J.) Sullivan, who long resided on these islands, does not believe that they are ever purely white. . . . In other parts of the Falkland Islands other colours prevail: near Port Pleasant brown is the common tint; round Mount Usborn, about half of the animals were lead or mouse coloured, which elsewhere is an unusual tint."

The resemblance of these white Ladrone and Falkland cattle to the British park-breeds is very remarkable; while still more so is the fact of their breeding true, and not tending to produce black calves. It would be of great interest to know the colour of the stocks from which they were respectively derived. In the state of Colombia, where half-wild cattle occurred in 1835 high up in the mountains as well as in the plains, there is one breed with soft, fine hair,

¹ *Vide* Darwin, *loc. cit.*

² *Loc. cit.*; see also *A Naturalist's Voyage Round the World*, 1884, ed. p. 191.

and a second in which the skin is absolutely bare; but it is not stated whether the latter are wild or tame.

The most remarkable of all South American cattle is, however, the so-called niatu or niata breed, which is stated by Darwin to have been in existence at least as early as the year 1760, when specimens were kept in the neighbourhood of Buenos Aires as curiosities. This breed must have originated subsequently to 1552, when cattle were first introduced into this part of America; and it is believed to have been developed by Indian tribes living to the south of the La Plata River. Darwin¹ described the breed as follows: "The forehead is very short and broad, with the nasal end of the skull, together with the whole plane of the upper molar teeth, curved upwards. The lower jaw projects beyond the upper, and has a corresponding upward curvature. The upper lip is much drawn back, the nostrils are seated high up and are widely open, the eyes project outwards, and the horns are large. The neck is short, and in walking the head is carried low. The hind legs appear to be longer, compared with the front legs, than is usual. The exposed incisor teeth, the short head and upturned nostrils, give these cattle the most ludicrous, self-confident air of defiance." A bull of this breed I saw in La Plata in 1893 was black and white: its skull is now in the British Museum.

European cattle were introduced by Columbus during his second voyage into the island of San Domingo,² and in twenty-seven years their number had increased to 4000, while in 1587 it was estimated

¹ *Animals and Plants under Domestication*, vol. i. p. 93.

² Brehm's "Tierleben," *Säugetiere*, vol. iii. p. 303, 1891.

at 35,000. The so-called Franqueiro cattle of Brazil are referred to in the next chapter.

Introduced cattle have run wild in the Galapagos, Philippine, and Sandwich Islands, in Celebes, and also in Australia and New Zealand.¹ Dr. von Lendenfeld, as quoted by Brehm, states that he found the cattle in the mountains of New Zealand so wild that it was almost impossible to get within shooting range; in colour they were brown (? red) and white. In Tasmania, according to Darwin,² most of the cattle first introduced were of the humped breed, but these were subsequently more or less completely eliminated by the introduction of ordinary humpless cattle from Europe. Colonel Przewalski³ has stated that wild cattle also occur in the heart of central Asia, but whether these are humped or humpless, or whether they have any yak-blood, is not apparent.

Before leaving this part of the subject, it may be mentioned that the old introduced breed of Texas was remarkable for the length of the horns. A skull in the Brooklyn Museum, New York, measures $4\frac{1}{2}$ feet across the horn-cores, while the horns themselves have a tip-to-tip interval of 7 feet. The old Texas breed is fast disappearing, owing to the introduction of shorthorns and other more profitable types.

Before leaving ordinary cattle reference may be made to the relative value of the milk of cows as compared with buffalo-milk. Professor G. Magini, who has made analyses of both, finds that the advantage, so far as nutritive qualities are concerned, is largely on the side of the buffalo. The results of the investigation are published in the *Atti della Reale*

¹ Brehm, *op. cit.* p. 304.

² *Op. cit.* p. 87.

³ Brehm, *loc. cit.*

Accademia dei Lincei, vol. xx. p. 267. They prove that buffalo-milk has a higher nutritive value for the human subject than ordinary cow's milk, this being due not only to its greater richness in fats and lactose, but likewise to its containing a higher proportion of albuminoid substances. Buffalo-milk has, however, a thick, ropy consistence, probably due to the larger percentage of solids it contains, and is therefore not pleasant to drink, while it is also less digestible than cow's milk. These disadvantages may be done away with by converting the richer portion of the milk into butter, cheese, etc., which are of excellent flavour and easily digestible.

The chief results of the analysis of buffalo-milk compared with that of cow's milk are as follows: In the first place, it has only about 81, instead of from 86 to 87, per cent. of water. On the other hand, it is richer in fats to the extent of about one-third (8·25 instead of 3·5), it contains a larger proportion of albuminoids (from 3·65 to 3·90 in place of from 3·48 to 3·56), it has more lactose (5·06 to 5·20 instead of 4·80 to 4·90), and more salts (0·8 to 0·98 instead of 0·7 to 0·8).

CHAPTER VII

THE HUMPED CATTLE, OR ZEBU, OF ASIA AND AFRICA

IN the preceding chapter it was necessary to allude to humped cattle in connection with the origin of the large-horned Spanish breed, and likewise when treating of the cattle of Egypt and Asia Minor; and it was shown that while the former, together with the long-horned cattle of Hungary, etc., have zebu-blood in their veins, some of the Syrian breeds are of the pure humped type, the ancient Egyptian cattle being likewise derived from the zebu, but having lost the hump. The present chapter is entirely devoted to the humped breeds, which belong to a species apart from the European *Bos taurus*, and known as *B. indicus*.

The name "zebu," which is in universal use all over Europe as the designation of the Indian humped cattle, is not a part of any of the numerous languages of India; and it does not appear to be of African origin, although humped cattle are found over the greater part of Africa, as well as in Madagascar. How it originated, and by whom it was first employed in literature, is difficult to ascertain; but there seems considerable probability that it was introduced into natural history literature by French

zoologists, as it is employed by Buffon in the first portion of his *Histoire Naturelle*, published from 1749-67. It is likewise used in the abbreviated English edition of that work, published in 1821, where zebu, or hunched oxen, are erroneously stated to be near relatives of bison. "In the whole continent of India," it is there written, "the Islands of the South Seas; in all Africa, from Mount Atlas to the Cape of Good Hope, we find nothing but hunched oxen; and it even appears that this breed, which has prevailed in all the hot countries, has many advantages over the others. These hunched oxen, like the bison, of which they are the issue, have the hair much softer and more glossy than our oxen, who, like the aurochs, are furnished with but little hair, which is of a harsh nature. These hunched oxen are also swifter, and more proper to supply the place of a horse; at the same time, they have a less brutal nature, and are not so clumsy and stupid as our oxen; they are more tractable and sensible as to which way you would lead them." Later on in the same volume it is stated, in reference to the hump, that "This hunch does not depend on the conformation of the spine, nor on the bones of the shoulder; it is nothing but an excrescence, a kind of wen, a piece of tender flesh, as good to eat as the tongue of an ox. The wens of some oxen weigh about 40 or 50 lb.; others have them much smaller; some of these oxen have also prodigious horns for their size."

With the exception of their presumed relationship to bison, and some details in regard to distribution, this account of humped oxen might almost have been written by a modern naturalist. The hump is still a favourite dish in India; and throughout the whole of



FIG. 1. ANCIENT EGYPTIAN LONG-HORNED OX



FIG. 2. WORN HORN OF BORNU OX

the peninsular portion of that country these cattle are the most common beasts of draught for both fast and slow traffic. So far as can be determined, the hump, although highly convenient for keeping the yoke in position, is quite useless to the animal; and it is probably a feature produced by domestication, just as are the masses of tissue at the root of the tail in fat-rumped sheep, which are likewise common to Asia and Africa. The excessive development of the dewlap in the humped cattle of India is perhaps also the result of domestication, since the great size of this appendage, as well as the presence of the hump, would probably be exceedingly inconvenient to a wild animal. In this connection it may be noted that the presence of a big dewlap in the Indo-Burmese cattle known as gayal, and its absence in their wild relative the gaur, affords another argument in favour of the view that the former is nothing more than a domesticated breed of the latter. The convexity of the forehead in Indian humped cattle may likewise be attributed to domestication, as it is absent in some of the humped cattle of Gallaland, in north-eastern Africa.

Although the zebu received its name of *Bos indicus* from Linnæus in the eighteenth century, naturalists were for a long time in doubt as to whether it ought to be regarded as specifically distinct from *B. taurus*. One of the first to recognise the undoubted distinctness of humped cattle was the late Mr. Edward Blyth, who pointed out some of their distinctive characters in the *Indian Field* for 1858.¹ They differ, remarks that naturalist, from ordinary humpless

¹ See Darwin, *Animals and Plants under Domestication*, vol. i. p. 83.

European cattle in general configuration, in the shape of the ears, in the point where the dewlap commences, in the typical curvature of their horns, in their manner of carrying their heads when at rest, in their ordinary variations of colour, especially in the frequent presence of nilgai-like markings on their feet, and "in the one being born with teeth protruding through their jaws, and the other not so." They have different habits, and their voice is entirely different. Humped cattle in India "seldom seek shade, and never go into the water and there stand knee-deep, like the cattle of Europe." They have run wild in parts of Oude and Rohilcund, and can maintain themselves in a region infested by tigers. They have given rise to many distinct breeds, differing greatly in size, in the presence of either one or two humps, in length of horns, and in several other respects.

In many of the humped cattle of northern and central India the dewlap is of great size, and commences close to the chin, this being also the case in a breed from the Blue Nile; whereas in European cattle this appendage, which never attains such large dimensions as in the former, does not start till well down on the throat. The nilgai-like markings on the feet referred to by Blyth take the form of white rings round the fetlocks in the darker-coloured Indian strains or individuals. In the Indian breeds, except those which are altogether white, there are also very generally white or light-coloured rings round the eyes. The forehead, as already mentioned, is frequently convex, with the portion above the eyes short.

The horns are very frequently large, especially in

the African breeds, although in some of the breeds from southern India they are quite small. In the Gujrati breed of India they have a distinctly double curvature, with a somewhat lyrate contour, their direction being at first outwards, then upwards, and a little forwards, and finally outwards and more or less backwards. Much the same type obtains in the African Galla cattle, in which, however, the horns are much larger and more massive, and in some cases show an inward inclination at the tips. A portion of the front surface is thus distinctly convex, instead of, as in the aurochs and most north European cattle, the whole of this surface being concave. These characters, which, as mentioned in an earlier chapter, are strongly developed in the large-horned Spanish draught cattle, appear to be a sure indication of zebu-blood wherever they occur, although, as will be shown later, they are by no means constant in all breeds of humped cattle.

As regards the skull, this is characterised by its general shortness, especially in the region of the forehead, and the slight prominence of the sockets of the eyes, which look more or less directly outwards, whereas in the aurochs they are very prominent, and set somewhat obliquely, so that the direction of the eyes is more forwards. These characters are strongly marked in Ankoli cattle. Frequently the forehead is convex.

In the Indian breeds the colour of the coat is very frequently iron-grey or some shade of pale fawn, becoming darker on the hump, shoulders, and neck, and also markedly darker in bulls than in cows. Moreover, black, or occasionally bay, bulls are by no means uncommon. On the other hand, in

southern India wholly white zebu are very common, although formerly parti-coloured animals, like the so-called "leopard cattle" of certain districts of Africa, were prevalent. The colour of the African breeds will be mentioned later.

The voice of the zebu partakes more of the nature of a grunt than a low.

Although humped cattle have run wild in certain parts of India, as already mentioned, and also in Formosa, in no part of the world are they to be met with in a truly wild condition; and in practically all works on natural history in which they are mentioned their origin is stated to be quite unknown, although it has been pointed out that their original home was doubtless in some portion of the tropical or subtropical regions of the Old World. Mr. Blyth was, indeed, inclined to consider that Africa was their place of origin; but the fauna of that continent is now much more fully known than was the case in his time, and as there are no wild African cattle other than buffaloes, it is practically certain that their wild ancestor is to be sought elsewhere.

The Indo-Malay countries are therefore those to which we naturally look as the original home of humped cattle; and since, as mentioned in an earlier chapter, there is evidence that the ancient cattle of Egypt, which were of the humped type, and therefore also the zebu-like breeds of Africa generally, came from the East by way of Mesopotamia,¹ it is a practical certainty that the Middle East, where the species is endemic, is the real home of *Bos indicus*.

This being so, the next point for consideration is the possibility of indicating any wild form of cattle

¹ Vide Dürst, *Die Rinder, etc.*, p. 73.

as the missing ancestral type. So long ago as 1878 Professor Rütimeyer,¹ from the comparison of a skull of the Galla humped cattle with those of the Indian gaur and the Javan bantin, expressed the opinion that the zebu was certainly derived from that Indo-Malay group of cattle, and most probably from the bantin itself. Since that date the range of the bantin (*B. sondaicus* has been found to extend into upper Burma, where the species is represented by a special local race (*B. s. birmanicus*); and an examination of a large series of skulls and heads leads me to conclude that Rütimeyer was probably right in regarding this species—or possibly a nearly allied extinct type—as the ancestor of the zebu.

To point out the characters in the structure of the skull on which Rütimeyer relied when expressing this opinion, would involve too much technical matter for a work like the present; and attention may therefore be restricted to certain other points. The bantin, like the gaur, is characterised by the presence of an elevated ridge on the withers, extending nearly half-way along the back, this ridge being formed by the tall spines of the vertebræ of the fore-part of the trunk. Such a ridge might apparently be converted without difficulty into the hump of the zebu, especially if the spines of the vertebræ were shortened. Comparison in this respect cannot, however, be carried further, as skeletons are not available.

In many bull bantin—both Javan and Burmese—the horns, which have the same nearly cylindrical section as those of the zebu, show a contour and double curvature somewhat similar to that of the

¹ "Die Rinder der Tertiär-Epoche," *Abh. schweiz. paläontologischen Gesellschaft*, vol. v. pp. 177, 178.

lyrate-horned type of humped cattle, as will be evident by comparison of the figure of a Burmese tsaine, or bantin, on Plate XXI, with that of the skull and horns of a Gujrati humped bull on Plate XX. In the tsaine-head the horns are directed outwards, backwards, then forwards and upwards, and finally inwards and backwards; and it results from this curvature that a convexity is present on the front surface, although situated somewhat higher up than in the Gujrati humped bull. In some Galla humped cattle the tips of the horns are directed outwards, as in the tsaine.

Bull tsaine have a comparatively large dewlap, extending well up on the throat, although not reaching to the chin.

Another point is that the tsaine is a tawny-coloured animal, darker in bulls than in cows, and approximating in both these respects to many of the Indian breeds of humped cattle. It is true that in both tsaine and typical bantin the legs are wholly white from the knees and hocks downwards, while there is a large white rump-patch. This rump-patch is, however, to a considerable extent smaller in the domesticated bantin of the Island of Bali, as is mentioned in the next chapter, and it therefore seems quite probable that the light fetlock-ring of humped cattle may represent the "white stockings" of the tsaine and the bantin.

As already mentioned, many humped bulls in India, especially the so-called Bramini bulls, are black, while the cows are generally, if not invariably, lighter coloured. This appears to be an indication of affinity with the typical Javan bantin, in which old bulls are black, while cows and calves are bay.



FIG. 1. MYSORE HUMPED OX

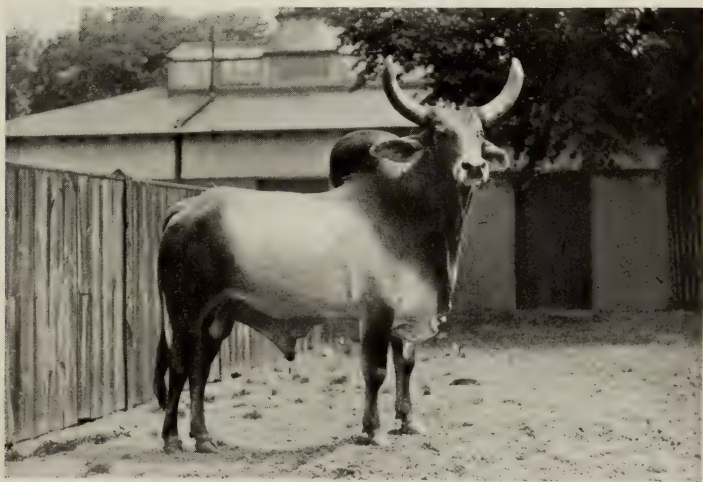


FIG. 2. GUJRATI HUMPED BULL

Passing on to a review of the chief types of humped cattle, it may first of all be mentioned that numerous breeds and sub-breeds are found in India, all of which have the horns comparatively slender, although they may be of considerable length. In North-west India the oldest representative of the species is the Gujrati breed, which is of large size, with big drooping ears, and the horns of the type described, as figured on Plate XX. The bulls are very generally dark iron-grey, while the cows are lighter; and the hump is often very large. In most of the other breeds the ears do not droop, and it is among these that the black bulls of upper and central India are found. The Gujrati breed, of which an adult bull is shown in Plate XVII, Fig. 2, is, as stated above, the old type of humped cattle of North-western India. In modern times there has, however, been produced—probably from the former stock—an altogether distinct type, known as the Hissar breed. This breed, of which an adult bull is exhibited in the British Museum (Nat. Hist.), was developed for the purpose of drawing artillery and military trains. It is of large size, and of great power, but of relatively slender build. Bulls are generally iron-grey, with relatively short black horns, curving to a considerable extent outwards and somewhat downwards.

The humped cattle of southern India, of which there are numerous breeds and sub-breeds, have been fully described by Colonel W. D. Dunn.¹ Among these, the bulls of the typical representatives of the handsome Mysore breed are frequently black, and

¹ *The Cattle of Southern India*, Madras (Dept. of Agriculture), 1909.

carry large humps, while the cows are grey or white. In both sexes the long horns are yellowish in colour, and curve in a bold regular sweep outwards and backwards, and then forwards and inwards, somewhat after the fashion of those of a waterbuck. In all cases the hump is of moderate size and non-pendulous. Mysore humped cattle are divided into two types, namely, the inferior Nadudana, or village cattle, and the Doddadana, or high-class cattle. The latter include the Amrat Mahal, Hallikar, Chitraldrag, Alumbadi, and other well-known breeds, all of which are specially adapted for fast roadwork, as they are quick, very high-spirited, and have extremely hard feet. Another distinct type is formed by the Ongole, or Nellore, cattle, of the east coast of Madras, to the west of Masulipatam. These are very large and handsome cattle, extremely docile and suitable for heavy, steady draught. In colour they are black and white and pure white, the latter hue being now most esteemed, although formerly black and white was preferred, except in the bullocks; the horns are small. Lastly come the Gaini, or dwarf, cattle, sufficiently characterised by their diminutive size, the adult bulls often standing not more than three feet at the shoulder.

In regard to zebu that have escaped from control in India, Dr. Jerdon¹ wrote as follows: "In many parts of the country small herds of these have run wild. Localities are recorded in Mysore, Oudh, Rohilkund, Shahabad, etc., and I have seen and shot one in the Doab near Mozuffurnugger. These, however, have only been wild for a few years. Near Nellore, in the Carnatic, on the other hand, there is

¹ *The Mammals of India*, London, 1874, p. 134.

a herd of cattle that have been wild for many years. The country they frequent is much covered with jungle and intersected with salt-water creeks and back-waters, and the cattle are as wild and wary as the most feral species. Their horns were very long and upright, and they were of large size. I shot one there in 1843, but had great difficulty in stalking it, and had to follow it across one or two creeks."

In the Punjab many of the native cattle seem to have a cross of the humplless breeds, the hump being small or absent, although the white fetlock-rings are commonly present. Possibly, as in the case of the old Egyptian breeds, the diminution or elimination of the hump may be due to selection.

Humped cattle, although not, apparently, of a pure type, are found in the south of China and Formosa. In describing these cattle, which are commonly known to Europeans in China as yellow cows, Mr. R. Swinhoe¹ states that they are of relative small size, and in some respects intermediate between humplless and the typical humped Indian breeds. They have, for instance, the head and dewlap of the type characteristic of the latter, as well as a small hump, and an otherwise straight back. The horns are, however, short, and the skull has some of the characters of that of the ordinary European humplless breeds, especially in regard to the prominence and obliquity of the eye-sockets, such features being very probably due to crossing with the larger cattle of northern China, which are more of the European type.

The following account of the humped cattle which have run wild in China and Formosa is quoted by

¹ *Proceedings of the Zoological Society of London*, 1870, p. 698, with figures.

Mr. Swinhoe from a Chinese newspaper: "The neighbouring hills have these animals in abundance. They are caught and tamed, and are trained for use in the ploughing of fields and drawing of carts. . . . Formosa has an abundance of wild cattle, occurring in herds of hundreds and thousands. When it is desired to capture them, a wooden stockade is erected with four sides, in one of which is left a door. The cattle are driven towards it until they all enter, when the gate is shut on them and they are barred in and left to starve. They are afterwards by degrees haltered and bridled, and treated to fodder and beans, until they become not different from domestic cattle." These Formosan cattle are of the same breed as the "yellow cows" of southern China, and must almost certainly have been introduced at some unknown date from that country, although Mr. Swinhoe was half inclined to believe that they might be aboriginally wild.

Turning to the humped cattle of Africa, it may be mentioned in the first place that many of these exhibit a development of horn quite unparalleled—both as regards length and girth—among the Indian breeds, while the hump does not seem to be ever very large, and may be absent, as has been already shown to be the case among the ancient Egyptian breeds.

As mentioned in the preceding chapter, the long-horned cattle of ancient Egypt died out at an early period—probably from pestilence; and at the present day it is but rarely that animals with long horns are seen in the country, and these of a type distinct from the Pharaonic breed.¹ Indeed, it is not till we reach

¹ R. Hartmann, "Haussäugetiere der Nilländer," *Annalen der Lande*, vol. xlv. p. 20.

that portion of Kordofan lying to the southward of Khartum, on the White Nile, and forming the territory of the Hassanieh tribe, that long-horned cattle are met with. Here such cattle are found in large herds on the open plains. They are large animals, for the most part light-coloured in Sennar, between the Blue and the White Nile, but generally dark in the Hassanieh territory on the White Nile. In the photograph on Plate XV of a long-horned ox from the Blue Nile, taken by Captain Stanley Flower, the colour is dark, and the large horns are directed mainly upwards and outwards in a slight and uniform curve. The dewlap starts from the under surface of the lower jaw ; and the tail-tuft is of medium size. Other cattle from the same district are light-coloured or parti-coloured, with larger tail-tufts, and shorter and more outwardly-directed horns.

The Bagara tribes of the Berbera district of Nubia, as well as the Denkas and Shilluks of the White Nile in the neighbourhood of Fashoda, own cattle which are said to be very similar to those of ancient Egypt, but are characterised by the huge size of their horns. They are stated to be slightly-built animals ; the hump varies in size, being in some instances large, and in others almost obsolete. All the cattle of the Shilluk tribe are smaller than those of the other two ; but the Bagaras and Denkas also possess a short-horned breed.

The cattle of the Nuer tribe, to the south of the White Nile, to the south-west of Sobat, are huge, heavily-built beasts, with somewhat lyrate and doubly-curved horns of great size, which are inclined markedly forwards, with a slight backward direction

at the tips, so that they approximate in some degree to the type of the Indian Gujrati breed. The hump is, however, much smaller than in the latter, and the ears are small and upright. These cattle are generally or always parti-coloured; and their forehead lacks the convexity of the long-horned breed of the Blue Nile. In several of these respects the Nuer cattle, like those of Gallaland, mentioned next, depart less widely from the wild bantin than is the case with many of the Indian breeds.

More to the eastward, in Abyssinia and Gallaland, are numerous breeds of humped cattle remarkable for the enormous girth of their huge horns; but many of them have of late years been more or less decimated by rinderpest. The breeds with the largest horns inhabit the lowlands, those from the mountains having these appendages of smaller dimensions. Some of the largest horns of all are met with in the cattle of the Arusi-Gallas and the Shilla tribe, especially those members of these tribes who inhabit the neighbourhood of Lake Zuay or Zwei. These Galla or Sanga cattle are generally white and have small or no humps, their muzzles being black, the legs relatively long, and the bones small. In stature these oxen are very large, and their horns, which rise vertically, and are often more or less nearly lyre-shaped, frequently measure close on four feet in length, and will hold four or five gallons of water.

The Bornu breed, from the country lying immediately to the south-west of Lake Chad, is also white, and apparently nearly allied to the last. According to the account given by Colonel Hamilton Smith,¹

¹ *The Animal Kingdom*, London, 1827, vol. iv. p. 426.



FIG. 1. HEAD OF ANKOLI COW



FIG. 2. NGAMI OX

they are of very tall stature, with distinct humps, and the horns, instead of rising vertically, curving outwards and downwards, somewhat after the fashion of those of an African buffalo, and the tips forming a small half-spiral turn. A pair of these horns, now in the Natural History Branch of the British Museum, was brought from Bornu by the explorers Captain H. Clapperton and Colonel D. Denham, on their return from the Lake Chad expedition of 1822-24, one of them being shown in fig. 4 of the plate facing p. 366 of the volume quoted in the footnote. The length along the curve is $42\frac{1}{8}$ inches, and the basal girth $23\frac{5}{8}$ inches. According to the original description, the horny sheath is very soft, distinctly fibrous, and at the base not much thicker than the human nail, so that the whole horns are very light, and the weight of the pair scarcely exceeds 4 lb. Moreover, the horns are stated to pass imperceptibly into the skin, so that there is no possibility of saying exactly where the one ends and the other commences.

This seems to have considerable bearing on the presumed derivation of the zebu from the bantin, as the latter species has a mass of horny skin on the vertex of the skull connecting the bases of the horns.

The dimensions of the Bornu ox-horns brought home by Messrs. Denham and Clapperton are greatly exceeded, so far as basal circumference is concerned, by plaster-casts of two huge detached horns sent some years ago to the British Museum from Madrid. In the larger of the two the length is $47\frac{1}{2}$ inches, and the maximum girth $33\frac{1}{4}$ inches, the corresponding dimensions of the smaller example being $28\frac{1}{4}$ and $27\frac{1}{2}$ inches. Both exhibit the small, close, terminal half-spiral described by Hamilton Smith as character-

istic of the Bornu cattle; and it is probable that the originals of the two casts were brought from the same country to one of the Spanish settlements in north-western Africa. The smaller of the two, which has a very small terminal portion, apparently agrees very closely with a single horn represented in fig. 1 of the above-quoted plate in vol. iv. of *The Animal Kingdom*, under the name of *Catoblepas brookii*, Hamilton Smith, of which it is the type; and I have therefore little doubt that this so-called Brook's gnu is founded on the horn of a Bornu ox. If worn down by age, a horn of the type of the smaller Madrid specimen and of that of the so-called *Catoblepas brookii* would have much the appearance, externally, of a well-worn horn of the great Indian rhinoceros (*Rhinoceros unicornis*); and in January of the present year Dr. M. Braun, of the Royal Zoological Museum at Königsberg, wrote to me about a horn in that collection which I believe to be a much worn one of the Bornu ox. The specimen has the form of a blunt cone, with the summit distinctly recurved; and, to use Dr. Braun's own words, looks externally like the worn horn of an Indian rhinoceros. It has a basal diameter of just over 8 inches, and a height of close on 10 inches—dimensions which would not be very different from those of the smaller Madrid specimen if the slender terminal portion were worn away by use.

The tribes of north-eastern Abyssinia, such as the Gadabursi and Eissa-Somali, own a breed of long-horned cattle stated to be very similar in general appearance and characters to the under-mentioned Damara cattle.

Southwards long-horned cattle, although absent from the eastern coast districts, are prevalent through the interior of the continent to the Lake region, and were formerly abundant in southern Darfur and Loango. In the Lake region itself Unyoro and Ankoli, lying to the eastward, respectively, of the Albert and Albert Edward Nyanza, are the homes of cattle with very long and shapely horns, and no distinct hump. In the case of the Ankoli breed the bulls are generally white and the cows red. The enormous horns, which are longest in the cows, are characterised by their relative slenderness and smoothness, those of the cows curving regularly upwards and outwards, with a backward direction at the tips, which are darker than the remainder. The ears are small. Except for their much greater size, the horns recall those of some types of the ancient Egyptian long-horned breed. In Unyoro the cattle are stated to be mainly greyish or light brown, the same being the case with those of the Victoria Nyanza district. Cattle of much the same type extend over the plateau between the lake last named and Tanganyika ; and the name of Wakuma or Watusi cattle has been applied to the whole group.

In the interior of East Africa the Masai, in the Kilimanjaro district, and the Wakua tribes also possessed humpless, large-horned cattle of the Watusi type. Southwards of the Zambesi and Cuneni Rivers the native tribes, before the great outburst of rinderpest, were the owners of vast herds of long-horned cattle. The horns of the Bechuana breed, for example, attained enormous dimensions, the tip-to-tip interval being stated in some instances to be fully $8\frac{1}{2}$ feet, and the length of single horns between

4 and 5 feet. Darwin,¹ for instance, records a skull in which the tip-to-tip interval is 8 feet $8\frac{1}{4}$ inches, and the total span measured along the curve no less than 13 feet 5 inches.

In addition to the long-horned and frequently humpless breeds, many of the natives of eastern and central Africa also possessed short-horned cattle with well-developed humps. Mr. S. L. Hinde,² for instance, has published a photograph of a group of such cattle belonging to the Masai, most of which appear to be uniformly light-coloured, although one has the face black.

“In common with the cattle owned by other tribes in East Africa,” writes Mr. Hinde, “the Masai cattle are extremely docile, and allow themselves to be handled by natives in a manner hardly credible. The herds of Masai cattle are, however, well able to protect themselves in daylight on the open plains, and a young lion, leopard, or hyæna has small chance of escape if he approaches a herd too closely. The whole herd will charge together, leaving nothing in their rear but a shapeless pulp to represent their over-bold enemy. Yet two children of five or six years of age can manage, guide, and hold such a herd without any apparent difficulty. One peculiarity of tropical African cattle is specially marked in East Africa; cows have complete control of their milk-supply, and the loss of a calf is a serious consideration, as it is customary to bring it alongside the mother before making any attempt at milking her. The calf is so well aware of the futility of trying to obtain nourishment before its mother is conscious of

¹ *Animals and Plants under Domestication*, vol. i. p. 92.

² *The Last of the Masai*, London, 1901, p. 78.

its presence, that when only a few days old, on being loosed from the calves' stall, it runs first under the nose of the cow before approaching the udder. This fact is recognised by the natives, who do not attempt to milk the cow until it has begun to lick the calf. In the event of a young calf dying, the Masai skin it, stuff the skin with straw, and when about to milk the cow, place the distended calf's skin under the cow's nose. In cases where it is impossible to bring a calf's skin to the mother at milking time, the Masai women often succeed in obtaining the milk by a subterfuge perhaps peculiar to themselves.

"Each Masai brands his cattle with his special mark, which, in the event of cattle being lost or stolen, is easily recognised, and prevents dispute as to the owner. The cows are milked twice a day—in the morning and in the evening."

The Botlitli and the Makololo, as well as the natives of Barotsiland, likewise formerly owned great herds of long-horned cattle. The Botlitli cattle were found in the neighbourhood of Lake Ngami; and in 1910 the British Museum received the skull and horns of a specimen of the Ngami breed which is now on the verge of extinction, as the result of the ravages of the rinderpest. This ox was the property of Mr. R. A. Bailey, the resident magistrate at Tsau, Ngamiland, by whom the skull and horns were presented to the museum. It had to be slaughtered on account of age, and is believed to have been the sole representative of its kind in the district. There was a hump on the withers, and the colour was red, without any admixture of white, except on and near the front fetlocks. The horns are enormous, their expanse being 8 feet 5 inches, and the length of one horn

along the curve 4 feet 8 inches. This specimen is intermediate between the two examples of the same breed catalogued in Mr. Rowland Ward's *Records of Big Game*, in one of which the expanse is 8 feet $7\frac{1}{2}$ inches, while in the other it is 8 feet 4 inches. The length of the horns in the first of the catalogued specimens is, however, much greater than in the museum example, namely, 7 feet 3 inches.

The skull of the Ngami ox is characterised not only by the marked backward sweep of the long, slender, and outwardly-directed horns, but also by the ridged or roof-like form of the bones of the forehead. This sloping away of the frontal bones from either side of a median longitudinal ridge is a feature common to the skull of the Ngami ox and to that of an extinct ox from the upper Tertiary rocks of the Siwalik Hills of northern India. From the presence of this peculiarity I described the latter many years ago as a distinct species, under the name of *B. acutifrons*¹; but I am now of opinion that the feature is connected with the backward sweep of the horns, and consequently that it may have no specific value. Further confirmation of this is afforded by the circumstance that a skull presenting the same feature has been discovered by Professor F. C. Ewart among ox-skulls of a more ordinary type from a deposit of Roman age at Newstead, near Edinburgh.

Long-horned cattle are also found in Madagascar, those in the west coast districts presenting a marked similarity to the East African Watusi breeds.

In South Africa the Hottentots formerly possessed

¹ *Paleontologia Indica* (Mem. Geol. Survey of India), Calcutta, ser. x. vol. i. p. 122, 1878.

a breed of long-horned cattle without humps; and from these appear to have been derived the trek-oxen of the Boers of the Transvaal, of which there are four strains, and likewise those of Cape Colony. These are light-bodied, large cattle, with long limbs, and, especially in the case of the oxen, enormous horns, of which the direction is largely outwards; very generally the colour of the coat is red. Rock-pictures of great antiquity indicate that these trek-oxen are of native origin, although, in Cape Colony at any rate, they appear to have been largely crossed with Dutch and Friesian cattle.

On the west coast the Herero of Namaqualand, who are the great cattle-breeders of this part of Africa, possess a breed of very long-horned cattle without humps, in which the tip-to-tip interval of the horns is often between 7 and 8 feet. Darwin¹ states, however, that some Namaqua cattle much resemble European breeds in size and shape, and have short, stout horns and large hoofs. Writing of the Damara breed, the same author observes that these "are very peculiar, being big-boned, with slender legs and small, hard feet; their tails are adorned with a tuft of long, bushy hair nearly touching the ground, and their horns are extraordinarily long." In some cases, at any rate, the coat is marked with dark blotches on a light ground, in the same "leopard" fashion as the ancient Egyptian longhorns.

Cattle agreeing more or less closely with this type extend along the west coast as far as Mossamedes and Benguela, although the horns seldom exceed 4 or 5 feet from tip to tip. Farther north, however, indigenous cattle are wanting for a considerable

¹ *Loc. cit.*

distance along the west coast, although a long-horned breed appears to have been imported into Loango. On the other hand, they seem to reappear in the Cameruns, since wood-carvings in the Berlin Ethnological Museum represent a long-horned breed, which probably still exists in the interior.¹ Although the coast of Upper Guinea is poor in cattle, Sierra Leone possesses a small breed with extraordinarily long horns, which is often exported to the south coast. In Senegambia there survive remnants of a breed of large cattle, light or dark grey in colour, with very long, lyre-shaped horns, and thus apparently approximating to the Galla cattle. In fact, long-horned cattle of this type would appear to extend uninterruptedly across the heart of the continent from Senegambia in the west to Darfur and the Egyptian Sudan in the east. Again, in the Lake Chad district, cattle are met with closely approaching the humpless Watusi breeds of the Uganda district. And, as stated on p. 160, the Bare or Kuri cattle of the Bornu have gigantic horns, sometimes 20 to 30 inches in girth, and with a lyre-shaped curve, bending upwards at the tips. They have mostly small humps, and are very like the Galla cattle, only still larger, their colour being light. They are likewise kept by the Budduma tribe on the islands in Lake Chad.

Long-horned cattle of the zebu type were carried by the early Spanish voyagers to many parts of the world; and the so-called Franqueiro cattle of the State of Sao Paulo, in Brazil, have preserved their original characters in a greater or lesser degree to the present day. The exact history of these cattle is not

¹ Dürst, *Die Rinder*, etc., p. 43.

known, but it is quite possible that they may be descended from a cow taken to Brazil from Andalusia by Jean de Salazar, about the middle of the sixteenth century; at which date the long-horned Spanish cattle may have been more like their African relatives than is the case at the present day.

Franqueiro oxen are characterised by the enormous length of their horns, which is stated to largely exceed that of the African Watusi breeds. The skulls—of which a specimen has been described by Professor A. Nehring¹—are stated to present the massive character of those of the Spanish long-horned cattle; but, according to Dr. Max Hilzheimer,² are relatively longer, and thus show an approximation to the type characteristic of the aurochs and ordinary European cattle, as has been mentioned in an earlier chapter.

Mention has also been made of the fact that the cattle first introduced into Tasmania were Indian zebu.

From time to time there may be seen in the windows of natural history dealers and curiosity shops pairs of ox-horns united at their bases so as to form a semi-crescentic whole, and ornamented with chocolate-coloured spots arranged in regular oblique rows. The substance of the horn has been scraped down till the superficial coating has been removed and the lower amber-coloured layer reached. The spots are deepest in colour at the thicker portion of the horns, but diminish in intensity towards the tips, thus giving the appearance of having been worn

¹ *Sitzber. Ges. naturfor. Berlin*, 1888, pp. 91 and 99.

² "Die italienischen Haustierte," *Korr.-Blatt. Deutsch. Ges. Anthrop. Ethnol. u. Urgeschichte*, vol. xxxix. 1908.

away. Where darkest, they often show a distinct marginal ring. So far as I can ascertain, the spots are produced by burning the growing horns; while it is probable that the country where the process is practised is some part of North Africa. If this be so, the oxen probably belong to the humped species. The horns are stated to be trained by means of bandages from an early stage of growth, and are annually burned with a hot iron. Such a mode of treatment would accord with the nature of the marks, alike as regards colour, the marginal rings, and the fact that those near the tip are fainter than the rest. The horns are scraped at frequent intervals during life, and polished after death.

CHAPTER VIII

OTHER DOMESTICATED CATTLE

AS stated in the preceding chapter, all the domesticated cattle of Africa appear to have been derived from south-western Asia, whence they were imported into Egypt some time previous—perhaps ages before—to 3500 B.C. From Egypt they probably spread gradually westwards and southwards till they reached the southern districts of the African continent, where, if the evidence of the above-mentioned rock-paintings be trustworthy,¹ they appear to have arrived at a very early date. This lack of indigenous domesticated cattle in Africa cannot be accounted for by lack of material on which to work, for the small red and other buffaloes of the western coast could probably have been domesticated—to a greater or less extent, just as easily as the buffalo of India. It may rather be attributed to a lack of capacity on the part of the natives of Africa, south of the Sahara—the Ethiopian Africa of naturalists—to subjugate and tame wild animals—a characteristic in which they are just the opposite of the Malays and several other Asiatic nationalities.

As a matter of fact, it seems doubtful whether Ethiopian Africans ever tamed and domesticated—

¹ *Vide supra*, p. 166.

except possibly in isolated instances—wild animals of any kind. They never tried their hand on the African elephant, or on any of the quaggas and zebras, let alone the larger antelopes. That they did not domesticate the ancestors of any of the numerous breeds of sheep and goats which are now spread over the country is evident from the fact that wild members of those groups are unknown to the south of the mountains of the Sudan and Abyssinia, and the Atlas range. And it is therefore practically certain that the domesticated sheep and goats had likewise an Asiatic origin. Their pigs, too, are likewise in all probability derived from an Asiatic source.

Much the same may be said with regard to the natives of North America, who, although they had the bison, the bighorn sheep, the white mountain-goat, and, in the far north, the musk-ox and the reindeer (caribou), never domesticated any one of these animals. It may perhaps be urged, from the fact that the European bison was never apparently domesticated, that its North American cousin was unsuited for such a purpose. But, from the fact that the prehistoric natives of Europe had domesticated cattle derived from another source, there was obviously no need for them to try their hand on the bison; and *prima facie*, there seems no more reason why the European bison could not have been domesticated, had the necessity arisen, just as well as the yak of Tibet or the buffalo of India. And what holds good in the case of that species would probably be equally valid in regard to the bison of the prairies. As a matter of fact, the only American natives who owned domesticated animals of any kind were the Incas of

Peru, who tamed the wild guanaco, and produced from it the two breeds respectively known as the lama and the alpaca, the former being a long-limbed and comparatively short-haired animal adapted for riding and carrying burdens, while the latter is a shorter-legged type, with a long fleecy coat, and served as a source of material for raiment and likewise as food. The Incas also domesticated one of the wild species of cavy, from which they evolved the ancestors of the modern guinea-pig.

In contrast to this innate incapacity for taming and domesticating wild animals characteristic of the natives of Ethiopian Africa and North America, is the faculty which the Malays and many other Eastern nations—together probably with many of the prehistoric tribes of Europe—have displayed in bringing the denizens of the forests and plains under human subjection. Asiatics have indeed succeeded in domesticating more or less completely several species of horned cattle. In the Malay countries they have, for instance, tamed the bantin; and if, as suggested above, humped cattle are derived from that source, they have likewise so modified its descendants that it requires considerable imagination to recognise the resemblances between the wild and the tame types. The gayal is another domesticated species, which, as shown below, there is good reason to regard as a derivative from the gaur, or seladang, but which in any case must have been originally tamed by the natives of the Indo-Burmese countries. Throughout India and Malaya we have tamed buffaloes, the little-altered descendants of a third species, while the Tatars of the highlands of Tibet have subdued yet another and widely different species,

the yak, or grunting ox, from which they have produced parti-coloured, hornless, and hybrid strains.

Taking these four species in the above order, the first for notice is the bantin, which, in the wild state, is typically a native of Java. All Javan bantin are easily recognised by their white legs and the larger or smaller white rump-patch. They have also a distinct ridge on the withers; and in old bulls there is a horny mass on the forehead between the bases of the horns themselves, which are nearly cylindrical in section. Apart from the white rump-patch and legs, cows, calves, and steers of the typical race are reddish brown in colour, but old bulls are black.

In the small island of Bali, lying immediately to the eastward of Java, and forming the first of the chain of islands collectively known as the Lesser Sunda Islands, domesticated bantin are kept in large numbers, and exported to Singapore, where they afford the main supply of beef. These Bali bantin apparently differ in no essential features from their wild relatives although the steers and oxen appear to be killed for the most part before they assume the adult black coat.

As mentioned in the preceding chapter, there seems to be considerable probability that the bantin is the ancestral type from which humped cattle were derived, at a period immensely remote, by careful selection; and if this be the case, the dorsal ridge of the bantin is evidently the starting-point of the hump of the zebu.

A great deal of discussion has taken place among naturalists with regard to the handsome cattle kept in a partially domesticated condition by the hill-tribes of the countries round the upper end of the

Bay of Bengal, and locally known either as the gayal or the mithan. Gayal are large, heavily built animals resembling the bantin in their white legs, and the presence of a distinct ridge on the withers, but without a white rump-patch, and with the general colour dark in both sexes; while they are further distinguished by the shape of the head and horns, the heavier build, shorter legs, and the great development of the dewlap. Their nearest relative is, however, the gaur or seladang (*Bos gaurus*) of the Indo-Malay countries, to which fuller reference is made in the next chapter; and the point at issue is whether gayal represent a distinct wild species, or whether they are merely a domesticated derivative from that species.

Compared with the wild Indian gaur, the 'gayal is a smaller and more heavily built animal, with a very large dewlap, a somewhat less prominent and conspicuous dorsal ridge, and a shorter and wider head, crowned with a pair of widely separated black conical horns, directed mainly outwards, and the vertex of the skull between the bases of the horns forming a nearly straight line, instead of rising into a high and forwardly-directed arch. The forehead is quite flat. In colour the gayal is normally a somewhat darker animal than the gaur, the tint of the hair, apart from the white of the lower portions of the limbs, being blackish with a tinge of olive.

In some gaur from the districts at the northern end of the Bay of Bengal the form of the skull approximates in some degree to that of the gayal; and this approximation is still more marked in the seladang, or Malay race of the gaur, in some individuals of which the ridge between the horns is

as straight, and the forehead as flat and short as in the gayal, although the horns themselves retain the flattening of the bases, the inward curvature of the tips, and the light colour characteristic of the typical gaur.¹

The gayal was described as a distinct species by Mr. Lambert in the *Transactions of the Linnean Society of London* for 1804,² under the name of *B. frontalis*; and for many years it was recognised as such by the majority of naturalists. No undoubtedly wild representatives of this so-called species have, however, been found, a supposed wild example from Tenasserim being in all probability merely one of a herd which, like others, had escaped from partial captivity.³

Matters remained in this state of uncertainty till 1900, when Mr. E. Steuart Baker, a tea-planter of Kachar, published an article in the *Calcutta Asian*,⁴ in which he described certain skulls more or less intermediate between those of typical gaur and typical gayal. At the close of his arguments, he summed up by observing that "I am now forced to the conclusion that there is no difference of specific value between the two animals, such differences as do exist being principally, if not entirely, the result of domestication."

This conclusion was greatly strengthened by my own discovery—already mentioned—as to the close resemblance between the heads of some examples

¹ See Lydekker, *Game Animals of India, etc.*, London, 1907, p. 63.

² Vol. vii. pp. 57 and 302.

³ See Blanford, *Fauna of British India—Mammalia*, London, 1891, p. 487.

⁴ February 20 and 27.

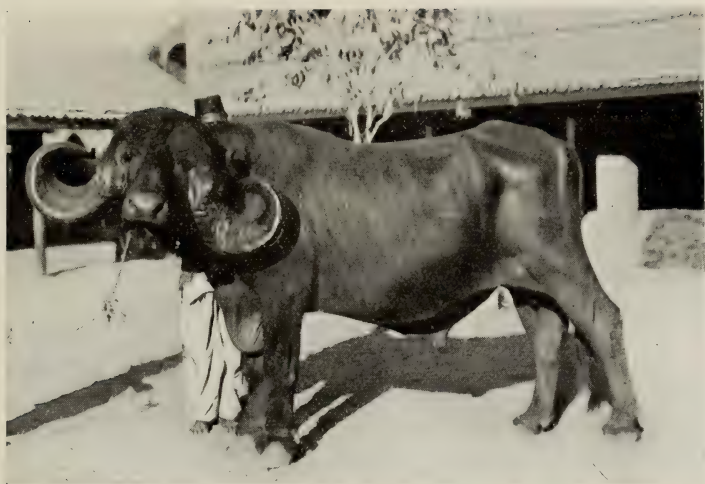


FIG. 1. KATHIAWAR BUFFALO



FIG. 2. DECCANI BUFFALO

of the Malay race of the gaur and those of the gayal. Further evidence in the same direction is afforded by the great development of the dewlap in old bulls of the latter, which starts almost from the chin, as in the Indian zebu; since in no undoubtedly wild species of cattle does this appendage attain anything like the same degree of development.

The probability is, therefore, that the gayal is merely a highly modified domesticated derivative from the gaur, which has been evolved in the countries inhabited by peoples of the Malay stock, who, as already mentioned, are adepts in taming and domesticating wild animals. If this be so, and if the animal be entitled to a scientific name of any kind, it should be known as *B. gaurus frontalis*.

The gayal, or mithan, was described by Lambert from the herds kept by the Kuki tribes of the hills of Tippera in a tame condition; but these handsome cattle are likewise maintained by certain hill-tribes on both the north and the south sides of the Assam Valley, as well as in Chittagong and parts of the Lushai Hills, whence their range probably extends to the borders of China. Throughout these districts there are also herds of gayal which have reverted to a more or less completely wild condition; and all the gayal in Tenasserim are probably in the same state.

The tame herds of gayal appear to be kept chiefly or entirely to serve as food, as they are never employed either in agricultural labour or for carrying burdens. It has, indeed, been asserted that they are likewise kept for dairy purposes; but, as Dr. Blanford has observed in the volume already quoted, most of the Indo-Chinese tribes who possess these animals are

not milk-consumers. The herds roam at will, unattended, through the forests by day, and return to their owners' villages at night.

According to a manuscript account left by Dr. F. Buchanan Hamilton,¹ gayal only occasionally breed in captivity, and the stock is chiefly replenished by the capture and taming of individuals from the local herds of wild cattle. "The usual plan employed to catch the full-grown gayal is to surround a field of corn with a strong fence. One narrow entrance is left, in which is placed a rope with a running noose, which secures the gayal as he enters the field to eat the corn; of ten so caught perhaps three are strangled by the noose running too tight, and by the violence of their struggles. Young gayals are caught by leaving in the fence holes of a size sufficient to admit a calf, but which excludes the full-grown gayal: the calves enter by these holes, which are then shut by natives who are watching, and who secure the calves. The gayal usually goes in herds of from twenty to forty head, and frequents dry valleys and the sides of hills covered with forest."

Some difficulty in accepting the above passage as it stands arises from statements to the effect that the cattle found in a wild state in some of the districts in question are truly wild gaur and not escaped gayal, Dr. Blanford² suggesting that at least some of the animals captured by the Kukis are gaur. If this should prove to be the case, it would go a long way in removing any doubts that may remain as to the specific identity of the gayal with the gaur.

Although, as already mentioned, the gayal is, ex-

¹ See Sterndale, *The Mammalia of India*, Calcutta, 1884, p. 486.

² *Op. cit.* p. 448.

cept for its white legs, normally a dark-coloured animal, many individuals are pied, while others are wholly white. In England, at any rate, gayal have bred with zebu, a fact which may in some degree tend to strengthen the view of the affinity of the latter to the banting-gaur group.

The next species on the list is the Indian buffalo, which to many of the native tribes of India is the most important of all domesticated animals, this being notably the case among the Todas of the Nilgiri Hills of Madras, by whom enormous herds are maintained for the sake of their milk and butter. Large herds are likewise maintained in many districts by the tribes living on the flanks of the Himalaya, where they are tended by half-wild gujars, or herdsmen. In many parts of the plains buffaloes are, however, mainly employed in agricultural operations, and as beasts of burden. Although buffalo-milk is very rich and nourishing, it has a thick, ropy consistence, a yellow colour, and a peculiar taste, decidedly unpleasant to most European palates. Buffalo cows give more milk than ordinary European cows, and the buffalo ox is as well adapted for labour as the ox of Europe. In Italy a highly esteemed cheese, known in Naples as *muzzarello*, is made from buffalo-milk (see p. 145).

Domesticated buffaloes are the descendants—frequently but little altered in form and other characters—from the huge wild buffalo (*Bos bubalis*) of the great and tall grass-jungles of Assam and certain other parts of India, which has a shoulder-height of at least six feet. Two distinct types of horns are met with in the arna, or wild Indian buffalo, those of one type curving regularly upwards and outwards and

then inwards, in a bold subcircular sweep, while in the other type they extend for a long distance almost directly outwards from the two sides of the head, and do not turn upwards, with a slight inward inclination, till near the tips. In both the circular and the straight type the horns of cows are more slender—and in some instances also longer — than those of bulls.

Buffaloes are not found at the present day in a truly wild state in any of the countries to the westward of the Indus; but Dr. Dürst¹ is of opinion that in the pre-Christian era their range included Mesopotamia. This opinion is based on certain Babylonian and other ancient monuments. One of the oldest Babylonian cylinders, of which the origin is definitely known from the inscription it bears, contains, for instance, the representation of a gigantic buffalo. This cylinder, which is made of brown jasper, dates from the reign of the North Babylonian king, Shargani or Sargon, that is to say from about 3800 to 3750 B.C. The cylinder represents a scene in which the legendary hero, Gishdubarra-Nimrod, also figures.

Although this is the most beautiful known ancient representation of a buffalo, it is by no means the oldest, for, according to the same authority, there is a cylinder dating from the reign of one of the earliest of the Babylonian sovereigns, King Sirgulla, about 5000 B.C., which shows an undoubted representation of a buffalo. The animal is also shown on other ancient cylinders, some of which are preserved in the national library at Paris. In all details these portraits are stated to accord closely with the Indian buffalo;

¹ *Die Rinder, etc.*, p. 5.

and they suffice, in the opinion of Dr. Dürst, to indicate the occurrence of the wild race of the species in Mesopotamia at these early epochs. There seems no reason for assigning them to an extinct species, more especially as there is evidence to show that the Indian elephant likewise ranged into the same country during the Babylonian epoch.

But the evidence for the former occurrence of the buffalo in Mesopotamia does not by any means end with the aforesaid cylinders. For Aristotle, in his *History of Animals*, refers to certain cattle then living in what is now the Russian province of Kokand, in which the horns were curved backwards over the shoulders. Such animals could scarcely be other than buffaloes—either wild or tame—and if they were living in Persia during Aristotle's time, 384–322 B.C., and were truly wild, it would be certain that the species likewise existed in Mesopotamia in 5000 B.C.

Dr. Dürst further suggests that the Assyrian name *rim*, which, as mentioned in an earlier chapter,¹ properly refers to the aurochs, may likewise have been used in a double sense, so as to denote also the buffalo. For it is known that in the year 878 B.C. King Assurnassirpal went on a hunting expedition to the land of Suehi, in the Euphrates valley, where, in the course of a few days, he slew no less than fifty full-grown *rim*, and took back with him twenty others alive. And the apparent occurrence of the *rim* in large herds accords much better with the habits of the modern buffalo than with what we know of those of the ancient aurochs.

“On all these grounds,” writes Dr. Dürst, “I consider it certain that a wild buffalo inhabited Meso-

¹ *Supra*, p. 61.

potamia from the earliest historical times, and very probably survived till the Assyrian era."

That these were wild, and not tame, buffaloes, is rendered practically certain, in the opinion of the same author, from the fact that the kings and heroes with whose portraits they are associated are represented as fighting or hunting lions and other wild beasts; and, secondly, that their horns differ from those of the modern tame buffaloes of Syria.

That these wild Mesopotamian buffaloes were confined to Asia, and did not extend into Egypt, seems to be rendered certain by the fact that these animals are not represented in the more ancient frescoes, and that the modern tame breed was introduced at a later date from Asia. Whether buffaloes existed in Egypt in the prehistoric epoch—as they certainly did in Europe—is, however, another question.

It is also doubtful whether the tame buffaloes which now abound in Palestine and other parts of Asia Minor are the direct descendants of the ancient wild buffaloes of the Euphrates and Tigris valleys, or whether they were a later import from the more eastern countries of Asia. Canon Tristram¹ stated, indeed, that "there seems reason to believe that they were not introduced till after the Khalifs overran Persia and brought them back," but he was unacquainted with the evidence in favour of the existence of the species in Mesopotamia during the epoch of the Babylonian monarchy. Still there does not appear to be any animal mentioned in the Bible which can be definitely identified with the buffalo.

At the present day buffaloes are met with in a more or less completely domesticated state through-

¹ *Natural History of the Bible*, London, 1867, p. 58.

out the Malay countries, a large portion of China, India, Afghanistan, Baluchistan, Persia, Mesopotamia, Syria, Hungary, the *landes* of Gascony, Italy, and, I believe, Spain, as well as Egypt, Algeria, Tunis, and probably Morocco.

In Italy they frequent the hot malarious plains, where they delight to wallow in the slimy mud, the districts where they are specially numerous being the so-called *maremmas* of Tuscany, the low-lying lands near the mouth of the Tiber, the Pontine marshes, and the swamps of Pesto. In the Pontine marshes they wallow by the score amid the tall reeds, standing still to stare at an occasional carriage when near the high road, and when tormented by gadflies muzzle-deep in the water.

According to Messrs. Hehn and Stallybrass¹ buffaloes were first seen in Italy about the year A.D. 600, in the reign of the Lombardian king, Agiluff, when, as we learn from a contemporary monkish writer, who alludes to them as *bubali*, they were regarded with astonishment by the natives. This usage of the term *bubali* leads, it may be mentioned, the authors just cited² to doubt whether the reference to the aurochs commonly supposed to be indicated by this word is correct.³ They point out that the word *bubalis* probably referred originally to an antelope—most likely the bubal hartebeest of north-western Africa—but as there are no true antelopes in western Europe, it must have been used in that part of the world to indicate cattle of some kind. This being so, there is nothing more likely than that it may have been applied indifferently to the aurochs

¹ *The Wanderings of Plants and Animals*, London, 1885, p. 355.

² *Op. cit.* p. 494.

³ *Supra*, p. 40.

and the buffalo, just as the Assyrian term *rim* may have been used for both, and as the name aurochs became transferred for a time to the bison.

In Tunis, where they are stated to have been introduced from Naples, buffaloes have reverted to a wild condition; and they also roam the plains of certain parts of Hungary in a nearly wild state, each herd being under the leadership of a master-bull. The Toda buffaloes of the Indian Nilgiris, although under the control of their owners, are likewise half-wild, and frequently attack natives of other tribes, while Europeans are known to have been now and then injured by their attacks. Much the same is the case with some of the buffaloes of the forests of the outer Himalaya, as I know by personal experience.

In spite of their being for the most part in but a half-domesticated condition, buffaloes in different parts of India have been very considerably modified by selection and elimination, so that there are now numerous more or less well-defined local breeds, distinguished by differences in bodily size, in build, in the form and length of the horns, and in certain other characters. None of these breeds, however, differs from the original to anything like the same extent as is the case with many breeds of European cattle.

One of the largest breeds is the Jafferabad, kept by the natives of the hilly forest-districts of Kathiawar in north-western India, old bulls of this type standing fully 5 feet at the shoulder. These buffaloes are heavy, ill-made beasts, with the large horns bending downwards, nearly at right angles to the plane of the centre of the forehead, and after continuing for some distance in the same direction, are curved in an

upright, outward, and finally inward direction, so as to form a comparatively close spiral.

The Delhi buffalo, which is bred throughout the United Provinces and the Punjab, is also large, bulls standing between 4 feet 7 inches and 4 feet 8 inches at the shoulder. These buffaloes are much better shaped than the Kathiawar breed, having deep, wide and short bodies supported on short sturdy limbs, short necks, and the head with a hollow profile, and lacking the great boss on the forehead which forms such a characteristic feature in the Kathiawar breed. The relatively small horns rise from the forehead in an upward and backward direction, and then curl over the head like those of a Scottish ram. Although retaining the deep black colour of the wild buffalo, the Delhi buffalo must, from the form of the horns, be regarded as a very specialised breed.

Smaller than either of the preceding types is the Gujrati breed, of which the best and most esteemed strains are found in Ahmedabad and Surat. In this breed adult bulls stand about 4 feet 4 inches at the shoulder; and in both sexes the colour may be black, black with white markings, or greyish. In the grey individuals the hair is really dun, but the skin is reddish brown, while the muzzle is slate-coloured. As regards make, the body is rounded, the neck is long, and the limbs are short and stout with tufts of bristly hairs at the knees. The horns are short, seldom exceeding 20 inches in length, and extend along the sides of the neck, terminating in a gentle inward curve which often brings their tips into contact with the neck or shoulder. In height and general form the buffalo of the Deccan is similar to the Gujrati breed, but the horns, especially those of the

cows, are much longer, reaching in many instances well behind the shoulder. In a well-grown bull they may attain a length of 3 feet.

Among the smaller breeds found in many parts of Madras may be mentioned the Godaveri buffalo, the buffalo of the east coast of Kistna, and the Carnatic buffalo, all of which, so far as can be judged from the photographs at my disposal, appear to be very nearly allied. The greatest length of horn in the Carnatic breed is attained in the cows. The Pedakimidi buffalo of the Ganjam district, on the other hand, is a larger and heavier breed, with shorter horns, which curve upwards and inwards not unlike those of the circular-horned race of the wild buffalo. In one individual represented in a photograph the fore-legs are whitish below the knees. In the Toda buffalo the curve of the horns is still more pronounced, their tips inclining markedly downwards as well as inwards. These Toda buffaloes are indeed much finer animals than those of the Madras plains, such as the Godaveri breed; and, as already mentioned, are much wilder and fiercer in disposition.

Among the Todas, according to Mr. W. H. R. Rivers,¹ female buffaloes, each of which has a name of its own, are held more or less sacred, although this sanctity does not necessarily extend to the bulls. Most bull calves are, indeed, killed at an early age, their carcasses being either employed in certain ceremonies or given away to the neighbouring people known as Kotas, by whom the flesh is eaten. A few are, however, kept for breeding purposes, usually in the proportion of one to every fifty cows.

It appears that only a certain number of the herds

¹ *The Todas*, London, 1906.



FIG. 1. SKULL AND HORNS OF GUJRATI HUMPED BULL



FIG. 2. YOUNG BULL BANTIAN

are considered sacred by the Todas, and it is by no means necessary that the bulls selected to run with these sacred herds should themselves be of sacred origin. At the present day only men are permitted to tend the buffaloes, women being also prohibited from milking them or from taking any part in the dairy operations carried on in the huts. There is, however, a tradition among the Todas that in former times the women were allowed to attend to the cows when calving. These people believe that buffaloes were created by one of their deities—On and his wife—those created by On himself being the progenitors of the sacred herds, while the ordinary buffaloes trace their descent to those created by the female deity.

A more or less sacred character likewise attaches to the buffalo-dairies of the Todas, this sacred character having, in the opinion of Mr. Rivers, been probably transferred from the buffaloes to the dairies and their utensils.

“It is in favour of this view,” writes the author, “that the buffaloes seem at one time to have been more sacred, or to have received more definite signs of reverence than at the present time. The evidence of the legends points to a time when buffaloes were regarded as having anthropomorphic characters, and they probably indicate a belief in the sacred character of these animals.”

It has been stated that in former days when the buffaloes of a Toda village were about to be penned for the night, they were saluted by all the members of the family to which they belonged, each of whom raised his or her hand to the face. This practice seems, however, to have fallen into disuse at the present day; and the only definite sign of reverence

now practised is a salutation, made partly to the sun and partly to the buffaloes, on the part of the herdsman when he leaves the dairy.

"The milk," continues Mr. Rivers, "is undoubtedly regarded as a sacred substance. There are distinct restrictions on its use which become more onerous as one ascends in the scale of dairies [some of which are more sacred than others], and there is reason to believe that the whole complicated daily ritual of the dairy may be designed to neutralise the dangers attendant on the conversion of the milk into substances which may be used by the outside world. . . .

"I think it is clear that at the present time none of the Toda buffaloes are so sacred that their milk in the form of ghi [butter] may not be used. . . .

"In earlier days, when the Todas led simpler lives than at present, when the bazars of Ootacamund and Coonoor were not in existence to act as incentives to the acquirement of gain, it is possible that the Todas did not sell the ghi made from the more sacred of their buffaloes, and it is even possible that at one time they were content to allow these animals to suckle their calves and made no use of their milk. Even at the present time a sacred buffalo will not be milked unless it is provided with the appropriate dairy and dairyman. . . .

"The various offerings of buffaloes made in connection with ceremonial are also not allowed to interfere with the economic value of the animals. In the *irnörtiti* ceremony of the village, the offered buffalo simply passes from one division of a clan to another, and when a buffalo is said to be devoted to the gods, it does not mean that the owner profits a whit the less on account of the oblation, but only that

he may not kill it at a funeral, and must allow it to die a natural death.

"Even the slaughter of animals at the funeral ceremonies appears to be managed so as to interfere as little as possible with the profits obtained from the sale of the milk. I think there is little doubt that it is an established custom to kill old and barren buffaloes on these occasions. An animal is not sent to the next world till its owner has got the utmost out of it in this."

All these sacrosanct observances connected with Toda buffaloes bear, it will be obvious, a close relationship to the veneration with which all kinds of horned cattle are regarded by the Hindus—a veneration so intense that under the old régime cow-slaughter was esteemed at least as great a crime as murder.

As stated on p. 183, Italian buffaloes are kept in the *maremmas* of Tuscany, the lowlands at the mouth of the Tiber, the Pontine marshes, the swamps of Pesto, and the Basilicata. According to Professor G. Magini¹ there were formerly something like 65,000 buffaloes kept in the southern provinces of Italy, out of which some 30,000 belonged to Pesto alone. Formerly Lazio had also about 30,000, although in 1881 there were only 2200; in 1908 the number had risen to 3700, and at the present time there is believed to be a further slight increase. In March 1911 the Pontine marshes contained 550; and in the previous year 32 were sent from this district to Naples, but Rome took none. From another district with 7000 head, 1000 were sent to Rome and Naples in 1910. Finally, it appears that during the last ten years there were 11,015 buffaloes

¹ *Atti della Reale Accademia dei Lincei*, ser. 5, vol. xx, p. 40, 1911.

(old and young) slaughtered in Naples, or about 1000 per annum, and in Rome 6659, or about 6000 annually.

In regard to the relative nutritive value of buffalo-beef as compared with ox-beef and veal, it is stated that the former is distinctly superior in several respects. It contains, for instance, a larger quantity of albuminoids, more nucleine, a substance rich in phosphorus, and a greater amount of muscular pigment, which abounds in iron. Buffalo-beef differs markedly in structure from ox-beef, the muscular fibres being thicker, and the nuclei more abundant; the latter circumstance accounting for the larger proportion of phosphorus. In transverse section the fibres, or bundles, of the muscle are polygonal, instead of irregularly shaped or subcircular; the component fibrillæ are larger, and there is a greater amount of the substance known as sarcoplasm. Differences also occur in regard to the proportions and mode of arrangement of the fat, connective tissue, and elastic tissue, so that an expert has no hesitation in distinguishing between the two kinds of beef.

Melville Island, situated off the northern coast of Australia, near Port Darwin, is noted for its herds of introduced Indian buffaloes. The number of these animals is estimated at between 15,000 and 20,000 head, and the number of calves born yearly at about 3000.

The last of the four species forming the subject of the present chapter is the domesticated yak (*Bos grunniens*) of the highlands of Tibet and parts of Siberia, without whose aid as a beast of burden and for riding travel in those desolate regions would be a practical impossibility. The yak is an animal easy

of recognition on account of the fringe of long hair, reaching in some instances down to the fetlocks, which clothes the flanks of the body, and the enormous bushy tail; the latter, in the pied or white breeds, forming the source of the *chaories*, or fly-whisks, in common use throughout India. Although pure-bred yak, which are always blackish brown in colour, are large and magnificent animals, they stand lower than most other cattle on account of the relative shortness of their limbs. Such pure-bred animals thrive only on the elevated plateaus of Tibet, such as that of Rupsu, at elevations of between 13,000 and 16,000 feet; and in summer cannot with safety be brought even to Leh, of which the elevation is 11,500 feet above sea-level.

There is, however, a half-breed known as the zo, which is originally a cross between the male yak and the female zebu; and these hybrids are capable of living at much lower levels, and will thrive even in England, where they are fertile among themselves. Many of these hybrids are black and white, white and grey, or wholly white; and it is their tails which, as already mentioned, furnish the Indian *chaories*. There is, moreover, a small black polled breed, which will likewise flourish at low levels.

All these hybrid or dwarf breeds are much more docile than the larger pure-bred yak of the Rupsu plateau. The latter are, indeed, vicious and spiteful brutes, which are really only half-tamed, and are apt, after running loose for several weeks, or even months, to cast their loads when first brought once more into active service, and will even charge the European onlooker who is awaiting their aid for the transport of his camp and baggage.

Tame yak have been known by repute in western Europe from the classical Grecian times, when they were called *poiphagoi*, that is, the eaters of poa-grass ; and the habit of eating nothing but grass and the refusal of corn constitute the one great fault in these animals. For in Rupsu and Tibet the spots where grass is suitable for grazing are often thirty or more miles apart, with one or more lofty passes between them ; and it is consequently necessary to push on from one of these grazing places to another—a matter which involves an early start in the biting cold of the morning, and frequently much protestation from the weary animals. When overdriven, or on very difficult ground, yaks give continual vent to the hoarse grunts from which they derive their scientific name of *B. grunniens*, these sounds being, it is said, peculiar to the domesticated breeds of the species.

Yaks in Ladak and Tibet are saddled with a rude kind of saddle formed of a prominent wooden pommel in front and an equally high cantle behind, the two being connected on each side by several parallel bars of hard wood. These saddles are used both as pack-saddles and for riding ; and in the latter capacity are about as uncomfortable trappings as could well be devised.

“ The sure-footedness and the steady though slow ascent of these animals up the most difficult passes,” writes Mr. Andrew Wilson,¹ “ are very remarkable. They never rest upon a leg until they are sure they have got a fair footing for it ; and, heavy as they appear, they will carry burdens up places which the ponies and mules of the Alps would

¹ *The Abode of Snow*, Edinburgh and London, 1875, p. 128.

not attempt. There is a certain sense of safety in being on the back of a yak among these mountains, such as one has in riding on an elephant in a tiger-hunt; you feel that nothing but a very large rock, or the fall of half a mountain, or something of that kind, will make it lose its footing; but it does require some time for the physical man to get accustomed to its saddle, to its broad back, and to its deliberate motion when its rider is upon it and not in a position to be charged."

In Leh and other valleys in Ladak the half-bred zo, of which the female is called zomo, is employed in ploughing; but the pure-bred yak does not take kindly to that kind of labour. Forty years ago the number of domesticated yak kept by the people of Rupsu was estimated at between four and five hundred.¹ These Rupsu Tatars depend entirely for their means of livelihood on their flocks and herds, and are the great carriers across the high plateau lying between Leh and Kulu, the smaller kinds of baggage being carried on the backs of sheep and goats, while the yaks are reserved for the burdens of greater weight and bulk.

¹ See F. Drew, *The Jummoo and Kashmir Territories*, London, 1875, p. 246.

CHAPTER IX

THE EXISTING KINDS OF WILD CATTLE

ALTHOUGH, as shown in an earlier chapter, the European aurochs became extinct in the first half of the seventeenth century, truly wild cattle have survived in all the great continents of the world, exclusive of South America (and, of course, Australia), as well as in some of the islands of the Indo-Malay region. In Europe, for instance, the bison lingers, in a protected state in the forest of Bielowitza, in the Russian government of Grodno, and in a perfectly wild condition in the valleys of the Caucasus. India is the home of that splendid beast the gaur, and likewise of the wild Asiatic buffalo. East of the Bay of Bengal, in Burma, Siam, Java, etc., the gaur is accompanied or replaced by the bantin or tsaine; while the Philippines possess a small wild buffalo known as the tamarao, and Celebes is inhabited by a still smaller member of the same group—and in fact the smallest of all wild cattle—locally called the anoa. The heart of the Highlands of central Asia is the chosen dwelling-place of the yak; and on the other side of Bering Strait we approach the domain of the American bison. Africa is inhabited solely by the African buffalo, with its numerous, and in some cases strikingly different, local races.

Just, however, as the aurochs succumbed to the spread of population and cultivation and the advance of civilisation in mediaeval Europe, and the bison was gradually driven eastwards to the forests of Lithuania (Grodno) and the Caucasus, several of the species of wild cattle which were represented by thousands, or even millions, of individuals in the first half of the nineteenth century have suffered woefully from the same causes, or from diseases which pioneer civilisation brings in its train. The most striking instance of this steady process of extermination in modern times is afforded, of course, by the American bison, which, with the exception of a few herds in the wilder districts of Canada, has practically ceased to exist. The African buffalo has been exterminated from a large portion of the southern districts of its native continent; while on the eastern side of the continent the herds were decimated some years ago by the ravages of rinderpest—a disease then new to Africa, and therefore exceptionally virulent in its attacks, and fatal in its effects. Everywhere, with the exception of the protected Government reserves, its numbers are being further diminished by an army of sportsmen and hunters, furnished for the most part with the latest developments of modern fire-arms.

In a minor degree the same story applies to the wild Indian buffalo and gaur, the range and numbers of which have been appreciably diminished in modern times, although anything in the form of precise details is lacking. Much more striking is the shrinkage in the range of the Tibetan yak, this species having been, according to the latest accounts, more or less completely killed out in Ladak and neighbouring

territories under the rule of the Maharaja of Kashmir, and occurring in numbers only in Chinese Tibet and certain other districts in the heart of central Asia. The typical bantin, again, owing to the damage it inflicts on the plantation and other crops of the planters, is stated to be yearly becoming scarcer in Java; while, as Upper Burma and the adjacent territories become more opened out and accessible, the same fate will be shared by its local representative, the tsaine. As to the prospects and present condition of the tamarao in the Philippines and the anoa in Celebes, information appears to be lacking.

All this points to the conclusion that, except in the more inaccessible and commercially valueless districts, wild cattle are a group destined to disappear more or less completely from the greater part of the earth's surface in the course of time. They have, in fact, everything against them. Their magnificent trophies are coveted—and who shall say unjustifiably coveted?—by the sportsman; their skins bear a high commercial value as a source of leather; they are prone to be swept away in thousands or millions by the appearance of rinderpest; they inflict untold damage on cultivated crops wherever they are numerous; and, lastly, their occurrence in large herds, such as those in which the American bison collected up to the middle of last century, is absolutely and completely incompatible with the settlement and cultivation of the country.

This has now, in spite of a former chorus of lamentations, been practically admitted by all capable of forming an opinion of any real value in the case of the American bison; and even writers who were at

one time on the side of the lamenters, have, in some instances at any rate, veered round to the opposite view.

For example, that great hunter of the American bison (or buffalo, as it was locally called), Colonel William Cody, who has been quoted as authority for the statement that the extermination of the species from the prairies of the West was a wicked and pitiful waste of the God-given resources of the country, subsequently wrote in a popular American journal as follows:—

“As I look back upon it I see now that it was a sharp, quick way of ridding the plains of a cumbrance that had to give place to a wiser use of these fine grass-lands. It was another instance of civilisation getting what it wanted and never minding the cost. Civilisation wanted the West, but it had no use for the Indian or the buffalo it found in possession of the West. The Indian and the buffalo had to go before the relentless march of the white man.

“We could not make a useful citizen of the Indian, nor could we run our brand on the buffalo. Extravagant as may seem the slaughter, the country is as much better for it as cities are better than tepees, and cattle and sheep are better than buffalo. A good many men living right here in Denver to-day can remember riding for days through mighty herds of buffalo too contemptuous of us in their numbers to mind the crack of the rifle in the least. At night we had to place guards around the camps to prevent these great herds from trampling us out of existence. We found fresh herds in almost every direction although each herd stayed largely on its own range.

“They chose the uplands for their ranges, where

the crisp buffalo-grass was plentiful and water good. They did not migrate in winter, but stubbornly faced the fiercest blizzards, relying for warmth on the hair matted thick upon their shoulders. While the buffalo was food and clothing and shelter for the Indian, the latter played no considerable part in the extinction of the species. The buffalo is a slow breeder, the cows dropping calves only once in two or three years, but the arrows of the Indians never diminished their number. The Indians were bold riders and good hunters, but they killed only to satisfy their own immediate wants.

"The herds did not suffer greatly from the rifles of lithe early trappers and scouts who conducted wagon-trains across the plains to California. These men were famous shots and hunted on horseback in bold dashes on the herds, as the Indians hunted, but they had no way of reaching a market with hides and meat, and killed only to supply the immediate needs of the parties they were conducting. After the civil war, when Uncle Sam began to multiply his posts in the great West, some of the best of these plainsmen became hunters for the Government and buffalo-meat was an important part in army-rations out here.

"We began to use breech-loaders about that time and the buffalo fell faster. I still have an old '48 Springfield which I used when hunting for the railroad construction gangs, and I suppose I must have killed 15,000 buffaloes with it. But it was the whistling of locomotives crawling farther and farther along the plains that sounded the doom of the bison. Even before the railroads were finished, the real attack on the herds began. The railroad-builders found

FIG. 2. HEAD OF FULL TSAINE



FIG. 1. HEAD OF BULL GAUR



this supply of fresh meat very convenient for feeding construction gangs, and good buffalo-hunters, who were not afraid to face the hostile Indians who hovered about, were in great demand. In 1867 I began killing buffalo for the Kansas Pacific, and shot nearly 5000 of them to feed the labourers who were building that line on to Denver. It was from them that I was named Buffalo Bill."

It is purely and simply a case of *Væ victis!*

The handsomest of all the living species of wild cattle is undoubtedly the gaur, or Indian bison, as it is so generally called by Anglo-Indian sportsmen, the *Bos gaurus* of naturalists; its stature, fine proportions, stately carriage, noble head, magnificent incurving, olive-green, black-tipped horns, blue eyes, and the short, sleek olive or blackish brown coat of both sexes all combining to render it a superb and peerless member of the ox tribe. The gaur of India is an easily recognised and unmistakable animal, some of its leading features being the highly-arched ridge between the horns, the concave profile of the forehead, which from its greyish hair stands out in marked contrast to the rest of the coat of the head and body, the bold and abruptly-ending fleshy ridge on the withers, the relatively short tail, scarcely reaching the hocks, and the white "stockings" to the legs.

The gaur appears to be the biggest of all the more typical wild cattle, although there is still some uncertainty as to the maximum height attained by the bulls. As a rule, they do not exceed from 5 feet 5 inches to 5 feet 6 inches at the shoulder, but there seems no doubt that a stature of from 6 feet to 6 feet 4 inches is occasionally reached. Even this great

height is stated, however, to be sometimes exceeded. A sportsman in the Nilgiri Hills of Madras, for instance, wrote to me that he had killed a bull which stood 6 feet 10 inches at the shoulder, while Mr. Steuart Baker has stated that in Kachar gaur will stand as much as 7 feet, and Colonel Pollok has made a nearly similar statement in regard to the Burmese representative of the species. Such dimensions may appear incredible; but it is difficult to refuse credence to the testimony of three independent witnesses, or to imagine that each of them had measured the height over the curves of the body instead of in a vertical line. Despite the alleged gigantic stature of the Nilgiri bull described by my correspondent, its horns were by no means especially large, the length on the outer curve being 29 inches, the maximum spread being $36\frac{3}{4}$ inches, and the basal girth $17\frac{1}{2}$ inches. The length from the muzzle to the root of the tail was 9 feet 5 inches, and that of the tail 2 feet 8 inches. This bull, which was very old and very thin, had a 12-bore bullet-wound in its shoulder of long standing.

Cow gaur and steers are somewhat lighter in colour than adult bulls, and in some districts display a tendency to redness. Calves have been stated to show a dark stripe along the middle of the back.

The range of the gaur comprises all the larger forest-regions of India from Cape Comorin to the foot of the north-eastern Himalaya, but does not include Ceylon. To the north-west the limits of the species in India are marked by the valley of the Narbada, while in the grass-jungles of the Ganges valley the species is met with only along the skirts of the Himalaya. Eastwards the range extends from

Nepal through the hilly districts on the south of Assam into Burma, and thence as far south as the Malay Peninsula, where it is known to the natives as the seladang.

The seladang (*B. gaurus hubbaki*) is distinguished by the greater downward extension of the greyish fawn-coloured area on the forehead, as compared with the typical Indian gaur, coupled with the presence of a whitish ring just above the naked portion of the muzzle. More important is the slight development, or absence, of the forwardly-inclined arch between the horns which forms such a distinctive feature of the typical gaur's skull. Some seladang-heads are, indeed, nearer in this respect to the gayal than to the gaur, and thereby afford confirmation of the view that the former is only a domesticated breed of the latter.

The Burmese gaur, or pyun (*B. g. readi*), is stated to have very heavy horns, of which the tips are seldom broken, a distinct dewlap (also present in some Travancore bulls), and a throat-fringe, while it is also characterised by its nearly black colour, and the backward extension of the dorsal ridge.

Several excellent accounts of the home-life of the gaur are to be found in works on Indian big game and sport, among which special attention may be directed to those by Captain J. Forsyth¹ and Mr. G. P. Sanderson,² the former dealing with the habits of these cattle among the picturesque scarped hills of the Pachmari Hills of central India. Of more recent date is an account of gaur and gaur-hunting

¹ *The Highlands of Central India*, London, 1889, 2nd ed.

² *Thirteen Years Among the Wild Beasts of India*, London 1890.

in northern India by the Maharaja of Cooch-Behar,¹ while Mr. T. R. Hubback² has described seladang-hunting in the Malay Peninsula. As the first two of these accounts have been quoted over and over again, while the works in which they occur are easily accessible to the reader, a very brief reference to the habits of the species will suffice on the present occasion.

Hilly districts, such as those of Pachmari, are the favourite resorts of gaur, which scale sharp ascents in a manner scarcely to be expected of animals of their size and bulk. Forest—bamboo or otherwise—is, however, essential to their existence; and it is in the shelter of these that the hottest hours of the long Indian summer days are passed. Equally essential are open glades where abundant grass can be found for at least a part of the year; while the near neighbourhood of water is equally important to the well-being of these animals. From 2000 to 5000 feet are the elevations commonly frequented by gaur in the Pachmari Hills; and one of the finest sights in the world is to see an old bull standing under the shelter of a clump of bamboos and surveying the prospect from the summit of a scarped precipice.

In the matter of colour the gaur is the most specialised of the more typical wild cattle, having discarded in both sexes the red or fawn which appears to have been the primitive type of colouring in the group for a blackish livery.

In the bantin (*B. sondaicus*), on the other hand,

¹ *Thirty-Seven Years of Big Game Shooting in Cooch-Behar*, London, 1908.

² *Elephant and Seladang Hunting in the Malay States*, London, 1905.

it is only the old bulls of the typical Javan race that develop a black coat, the cows and steers, as well, of course, as the calves of both sexes, being red. This, however, is not all, for in the Burmese representative of the species, locally known as the tsaine or hsaine, and technically as *B. sondaicus birmanicus*, the adults of both sexes are, at least for the most part, tawny. So distinct, in fact, is the tsaine from the typical bantin that, unless intermediate forms exist, there are considerable grounds for regarding it as a species by itself.

Unfortunately, both the typical bantin and the tsaine are, at the time of writing, very badly represented in the exhibition galleries of the British Museum, where, apart from skulls and horns, only heads of adult bulls are shown. In consequence of this it is difficult to say whether tsaine have the white rump-patch characteristic of the bull Javan bantin; no such feature is, however, mentioned in the following description of a bull of the former.

Bantin and tsaine resemble gaur in having the lower portion of the legs white, and also in the presence of a ridge on the withers, although this is less developed than in the latter. The most characteristic feature of the species is, however, the presence in adult bulls of a mass of horny skin on the upper part of the forehead connecting the bases of the horns, and passing imperceptibly into their structure. The horns themselves are less compressed and more nearly circular than those of the gaur, and are frequently very rough and thrown into partial ridges or folds. Their tips are strongly inclined inwards, and generally also show a more or less marked backward trend; while, as mentioned in an

earlier chapter, they may be imperfectly lyrate in shape. The tail of the bantin is relatively longer than in the gaur, reaching to below the hocks; and, at all events generally, there is a small dewlap. Adult Javan bantin, at any rate, have a conspicuous white rump-patch, which surrounds, although it does not include, the root of the tail.

As the tsaine is still imperfectly known in Europe, it may be useful to reproduce, with some omissions and verbal alterations, the description by an anonymous writer in the *Asian* newspaper of an adult bull shot in June 1906 at Tammu, on the north-eastern frontier of Burma.

There is a distinct dorsal ridge, which ends abruptly about the middle of the back, but no distinct hump. The general colour is light red, becoming lighter as the flanks and under surface of the body are approached, where the colour is almost greyish, intermixed here and there with white. The inside of the thighs is yellowish grey, where the skin is almost devoid of hair, and secretes an unctuous brown substance. The inside of the fore-legs and the under part of the chest are of a greyish white, and the anterior portion of the fore-leg, from the knee upwards, reddish black, this tint being also slightly marked on the hind-legs. There is a vestige of a dewlap, about three inches in its greatest breadth. The hair is short and glossy in the redder parts, but coarse and thick in the grey parts. On the belly the skin is about half an inch thick, but nearly an inch on the neck, the surface of the body being pitted and scarred here and there from bites of insects and wounds. The upper part of the head in front and at the sides is tawny white; but the

under surface is lighter and almost grey, while the muzzle is greyish black and the neck reddish brown. The lips are greyish white, covered with black bristles, and the lower lip has a fringe of long grey hairs projecting from its under surface. The tail has a distinct reddish-brown tuft. The ears are comparatively small, when compared with those of the cow, their upper part being reddish brown, while behind they are greyish white, with the tips and anterior edges jet black. Greyish-white hairs of considerable length project inwards from the anterior border, and the interior of the ear is saffron. The colour of the eyes is brown, and that of the cornea bluish white. On the upper part of the head over the frontal region, instead of skin covered with hair, is a thickened horny mass of a greyish black in colour; its general surface is smooth, but in patches very warty like the skin of a rhinoceros. This horny mass extends like a chaplet over the head, so that the area it occupied would be represented in the dry skull by lines drawn between the upper part of the orbit and between the bases of the horns at the vertex of the skull. Between the horns this horny tract forms a distinct projection or crest; it was soft on pressure and slightly moveable. This skin evidently forms a most excellent cushion for breaking the shock of any concussion on the forehead, *e.g.*, as in fighting.

It will be noticed that in this description no mention is made of a white rump-patch; and none is visible in a photograph of the spotted Siamese tsaine. The range of the bantin includes Java, apparently the Malay Peninsula, Siam, Anam, Yun-nan, Upper Burma, and some of the adjacent countries;

but its precise limits are still undefined. Some at least of the old bull tsaine of the forests of Siam are marked all over the head and body with minute white flecks; on the assumption that this animal represents a distinct race of the species, it has been provisionally named *B. sondaicus porteri*.

The habits of both the typical bantin and the tsaine appear to be generally very similar to those of the gaur, although it has been suggested that the bantin is even a still better hill-climber than the gaur. The presumed relationship of the bantin to the domesticated zebu has been sufficiently discussed in an earlier chapter.

As the wild yak (*B. grunniens*) differs from the pure-bred domesticated black yaks of the Rupsu plateau, of which the leading characteristics have been mentioned in the preceding characters, mainly by its superior stature and bigger horns, nothing in the way of description is required in this place. It may be mentioned, however, that fine specimens of the horns of the bull may attain a length of between 34 and 38 inches; and that the shoulder-height in the same sex appears to range between 4 feet 10 inches and 5 feet 6 inches. As mentioned in the preceding chapter, wild yak are stated not to utter the grunting noise characteristic of the domesticated breed.

Apparently the nearest living relatives of the yak are the bisons. The typical home of the species is the elevated plateau of Tibet, where these hardy cattle are found at elevations of, approximately, from 14,000 to 20,000 feet. The range of the species extends, however, into the northern districts of Ladak, and in the other direction into Kansu, in the north-

west of China, while it probably includes some parts of central Asia lying to the north of Tibet.

In these desolate regions, such as the great plain of Chang-Chenmo and the region round the beautiful Pangkong Lake, yak were formerly to be found in large numbers, as they still are in parts of Chinese Tibet. Although in many places the herbage looks scarcely sufficient to maintain rabbits, yet yak, wild sheep, and kiang, or so-called wild asses, thrive upon it and maintain themselves in good condition during the summer months. Probably, however, they must experience considerable difficulty in finding adequate nutriment during the long and frightfully cold winter. Yak must, indeed, have absolutely iron constitutions to withstand the bitter winter blasts and biting winter cold of these elevated regions. But nothing seems to hurt them; and they will lie down quite contentedly on a bed of snow or a glacier, as their vital organs are protected from cold when the animals are reposing by the thick mass of long hair clothing the flanks, this being apparently a special provision to suit their habitat.

The latest writer on the habits of the wild yak in its native home is Major R. L. Kennion, from whose book entitled *Sport and Life in the Farther Himalaya*¹ the following notes and extracts are taken.

After mentioning that in Chang-Chenmo there are two kinds of grass—a coarse, scanty kind that grows on the hill-sides, and a shorter and more succulent species known to the Ladakis as *spang*, which grows in the valley-bottoms and near water—Major Kennion observes that—

¹ Edinburgh and London, 1910.

“Yak prefer the latter, and are rarely found far away from it except when on the move. These bovines are, of course, ridiculously easy to see and quite unmistakable when seen. Bulls and cows are not readily distinguishable at a distance. The males stand higher and are bigger all round, having especially much bigger necks than the cows. They have also bushier tails, and their horns are thicker, and do not, like the cows’ horns, have a marked terminal upward curve. . . .

“The biggest bulls are usually found alone or with one or two companions of their own sex, except in the late autumn, when they join the herds. It must be admitted that the yak, uncouth, hirsute, and monstrous as he is, fails somewhat in dignity of appearance. His head is set on too low, while the matted fringe of hair falling down from his flanks and quarters like petticoats, and the great bush of hair at the end of his tail, give him an aspect more ‘prehistoric’ than majestic.”

According to the same writer, wild yak, owing to the incessant pursuit on the part of European sportsmen, have now been driven from Chang-Chenmo and other parts of Ladak, so that they are no longer found—or, at all events, only as occasional stragglers—in Kashmir territory. It is hinted, moreover, that they have even been driven away to some extent from those portions of Chinese Tibet lying adjacent to the Kashmir frontier, so that they are to be found in numbers only in the interior of the latter country, where they are more or less secure from the rifle of the European sportsman.

When the aurochs inhabited Europe it was accompanied throughout the greater part of its range

by the bison or wisent (*B. bonasus*), the zubr of the Russians; and when the former animal became extinct, its name was transferred to the latter. Whether aurochs and bison actually inhabited the same ground may be doubtful; but, although the latter does not seem to have extended into northern Africa, certain it is that both were found over the greater part of Europe. Unfortunately, there is some difficulty in ascertaining the precise limits of the range of the bison, owing to the fact that it was preceded by a closely allied extinct species (*B. priscus*), which has itself been split up into several local forms.¹ The wonderful rock-paintings on the walls of the cavern of Altamira, in Spain, prove that bison formerly inhabited that country; and there is likewise evidence that they once existed in Greece.² The remains of the fossil bison are found in the British Islands, but there does not appear to be evidence of the occurrence in that area of the modern bison. The range of the latter is, however, known to have extended from western and southern Europe through the intermediate countries to Poland, Russia, and the Caucasus, while there is evidence that it likewise stretched so far north as the valley of the Lena, in Siberia.³

In the chapter on the aurochs and its extermination incidental references have been made to the occurrence of the bison in the Hercynian forest in the time of Julius Cæsar, and its survival in Germany during the Middle Ages. Reference was also made to its

¹ Hilzheimer, "Beitrag zur Kenntniss der fossilen Bisonten," *Sitzber. Ges. naturf. Freunde*, Berlin, 1910, p. 136.

² Dürst, *Die Rinder*, etc., p. 8.

³ Hilzheimer, *op. cit.* p. 145.

existence in the Jaktorowka and other Polish forests in the time of Count Herberstein, that is to say, about the middle of the sixteenth century. Like the aurochs, the bison was gradually killed off in western Europe as cultivation and civilisation advanced, so that the range of the species became restricted to the more eastern and northern parts of the Continent. When it finally disappeared from France and western Germany does not appear to be known; but there is evidence that the last East Prussian bison was killed by a poacher in the year 1755 between Labiau and Tilsit.¹ Eventually the species became restricted to the great forest of Bielowitza, in Lithuania—the modern Grodno—where the herd exists in a protected condition, and to certain parts of the Caucasus, where the animals are thoroughly wild, although protected by forest-laws. The existence of these Caucasian bison was overlooked by the majority of English naturalists till late in the nineteenth century, although so early as 1842 Professor David Low² wrote that “bisons are still found in considerable herds in the woods of the Caucasus,” adding that Nordmann had recorded that they existed in the greatest numbers in the district lying between the valleys of the Kuban and the Psib. According to later accounts, these wild bison are restricted to an area of some two hundred kilometres (125 miles) in diameter in the neighbourhood of the sources of the rivers Laba and Bjellaja, on the northern flank of the main range of the Caucasus, extending eastwards to the head-waters of the Zellentchak; and even these are said to be scarce.

¹ A. Mertens, *Museum für Natur—und Heimatkunde*, 1906, p. 64.

² *Domesticated Animals of the British Isles*, 2nd ed. p. 208.



FIG. 1. BULL BISON



FIG. 2. BULL AMERICAN BISON

That bison once extended into Asia Minor is indicated by the occurrence of fossilised teeth discovered by Canon Tristram¹ in the Lebanon district, which were referred by Professor Boyd Dawkins to the extinct *B. (Bison) priscus*. Assuming the determination to be correct, Dr. Dürst remarks that it is by no means certain that the extinct species survived to Assyrian times. It is added that a wild bull with a mane-like coat on the fore-quarters, represented in the Assyrian sculptures, can scarcely be regarded as decisive evidence of the occurrence of bison in Assyria.

The history and habits of the bison-herd in the Bielowitza forest—an area of several thousand acres—have been so often quoted that a very brief notice will suffice in this place. The herd has been subject to many vicissitudes, having suffered more or less severely during the various Polish revolts, in one of which a number of the animals were killed. It attained its maximum in point of numbers between the years 1851 and 1860, the largest number of individuals living in modern times having occurred in 1857, when the total was 1898. In 1892 the number had become reduced to 375. At that time there was, however, living—apparently in a state of still closer captivity—a herd of 101 head in the neighbouring forest of Swisslotsch, the members of which originally came from Bielowitza. In addition to these the Duke of Pless maintains a herd, likewise of Lithuanian origin; and a few head are kept by Count Joseph Potocki in his game-preserve at Pilawin, in Volhynia.

During winter the bison in Bielowitza are supported on fodder supplied to them by the keepers of the

¹ *Die Rinder, etc.*, p. 8.

herd. The main danger attending the future prospects of the herd arises from the circumstance that when wild animals are kept under conditions other than those which properly belong to them, there is a great tendency for the proportion of males among the offspring to increase in an alarming degree at the expense of the females. To such an extent did this abnormality prevail a few years ago in some of the herds of American bison in the United States, that in the case of the herd in Bronx Park, New York, every calf was put down as a bull as a matter of course. There appears to be no definite information with regard to the numbers of the wild Caucasian bison, although, as mentioned above, these are believed to be comparatively small.

From all other Old World cattle bison are distinguishable at a glance by the excessive height of the withers, their uniformly brownish coat, with a tinge of plum-colour, and the mass of elongated curly hair covering the forehead of adult bulls, and, especially in the winter coat, extending backwards to form a mane on the neck, a fringe on the throat, and a mantle on the fore-quarters generally. To these features may be added the short and massive form of the head, the moderate length of the tufted tail, which reaches to the hocks or just below, and the regular upwards, forwards, and inwards sweep of the cylindrical and wholly black horns. In height adult bulls appear to exceed six feet by an inch or two; but the cows are distinctly smaller.

External features afford, however, by no means the most distinctive characteristics of bison, which differ markedly from the more typical species of cattle by the form of the skull. In the aurochs and ordinary

domesticated cattle, for instance, the transverse ridge on which are carried the horns is situated on the extreme vertex of the skull, so that its hind surface is situated practically in the same plane as the occiput, which is thus completely concealed when the skull is viewed from in front.

In bison, on the other hand, the horns and their supporting ridge are situated some distance below the plane of the occipital surface of the skull, so that the raised arch or rim which forms the upper border of that surface is distinctly visible in a front view. Then, again, the upper part of the skull of a bison is very much shorter and wider than that of an ordinary ox, with the forehead somewhat convex, the distance between the bases of the horn-cores and the sockets of the eyes much shorter, and the eye-sockets themselves very prominent and tubular. In these latter respects the skull of a zebu is somewhat nearer that of a bison than is the skull of a typical ox, although the setting-on of the horns still affords an easy means of distinguishing between bison and zebu skulls. Finally, it is important to mention that the skeleton of a bison differs from that of an ordinary ox by having fifteen, in place of twelve, pairs of ribs.

Forests with abundance of marshy ground, like that of Bielowitza, appear to be the favourite resorts of bison, which subsist largely by browsing; and those kept by Count Potocki have a habitat of this nature. When alive, bison exhale a peculiar musky odour. The winter coat is everywhere long; and in spring this is shed in large blanket-like masses, leaving the hair on the hind half of the body short and sleek.

For many years after it became well known in England, the Caucasian bison, in spite of some slight differences in colouring, was regarded as inseparable from the Lithuanian animal. In 1906 it was, however, raised by Mr. C. Grevé¹ to the rank of a separate subspecies, under the name of *Bison bonasus caucasicus*. Three years later Dr. Max Hilzheimer,² who based his opinion on certain details in the structure of the skull which need not be discussed on the present occasion, went a step further than this, and came to the conclusion that the Caucasian bison, in place of being merely a local race of the Lithuanian species, represented a species by itself, whose affinities were nearer to the American than to the Lithuanian bison; and he accordingly proposed that it should be henceforth known as *Bison caucasicus*.

The American bison is, however, undoubtedly a derivative from the primitive bison of Europe, and it is therefore only reasonable to expect that as we proceed from west to east the European bison would approximate in some degree to the American. Moreover, in the number of its ribs, as well as in its general form, appearance, and colour, the Caucasian bison is essentially similar to the Lithuanian and quite unlike the American species; and there can accordingly be little hesitation in continuing to regard it as a local race of the former, which in certain skull-characters shows some approximation to the latter. On this view, if all the species of

¹ "Der Kaukasische Wisent," *Zoologischer Beobachtungen*, Frankfurt-am-Maine, vol. xlvii. p. 269, 1906.

² "Wisent und Ur im K. Naturalienkabinett zu Stuttgart," *Mitt. K. Naturalienkabinett zu Stuttgart*, 1909, p. 241.

cattle are included in a single generic group, its designation will be *Bos bonasus caucasicus*. A fine bull of this race shot some years ago stood 5 feet 11 inches at the withers. A length of 18 and a girth of 16 inches are good dimensions for European bison horns.

In regard to the name *bonasus*, it appears that this was used by Aristotle to denote the wild ox of Pannonia, or Pæonia—the modern Austro-Hungary and some of the neighbouring States. Whether it really applies to the bison, as distinct from the aurochs, may perhaps be doubtful, more especially as the ancient Greeks employed the name *bisōn* for the former animal.

In the foregoing account of the European bison it is mentioned that its fossil remains occur in the Lena valley of Siberia; and it may be added that skulls and bones of more or less nearly allied extinct bison extend right across Siberia and also recur in the frozen cliffs bordering Kotzebue Sound on the eastern side of Bering Strait. Obviously, then, we are on the track followed thousands and thousands of years ago by bison—which, like all cattle, were originally an Old World type—in the migration by a land-bridge across Bering Strait from the Eastern to the Western Hemisphere, at a date when the severity of the climate was probably less intense than is the case at the present day.

In upper Canada we enter the domain of the modern American bison, or buffalo, as it is so frequently called in its native country, which is the only living species of wild cattle to be found on the American continent. Most unfortunately, this species is now generally known in scientific

literature by the designation properly belonging to its European cousin, namely, as *Bos*, or *Bison*, *bison*, in spite of the fact that it has the alternate and much more appropriate title of *Bos americanus*. The name of *B. bison*, which is now believed to apply to the American animal, although the opposite view was prevalent for many years, was, however, published at an earlier date than *B. americanus*, and is, therefore, according to modern views on nomenclature, entitled to stand, in spite of its inappropriate character.

Here it may be mentioned that the popular name bison, which belongs of right solely to the European species, is applicable to the American animal only as a kind of courtesy title; and as the two undoubtedly represent distinct species, it would be far better if the western animal had a separate popular name of its own.

In its Canadian haunts the American bison is, like its European cousin, a forest-dwelling ruminant, whereas in the days of its prime the bison of the United States was a denizen of the open prairies of the west. It has been generally assumed that the prairie animal was the primitive type, and the forest-haunting race (scientifically known as *B. bison athabascæ*) a later derivative. But, unless there be historical evidence to the contrary, it would seem, from the fact that the European bison is a forest-dweller and that the Canadian race of the American species is not only likewise an inhabitant of forests, but also the one living nearest to the route by which the members of the group made their way into the New World, far more probable that *B. bison athabascæ* is the primitive type of the western species.

If a cattle-breeder were asked to pronounce an opinion as to the more important differences by which the American is distinguished from the Old World or typical bison, he would probably commence by pointing out that the latter is a far better made animal than the former. And this would be a perfectly true statement, for, as a matter of fact, the American bison, although well built and imposing enough as regards its head and fore-quarters, falls away lamentably behind, so that it has hind-quarters of a most inferior type. This sloping away of the hind-quarters is indeed the one weak point in the make of the American bison, which, were it not for this deficiency, would be a really magnificent animal; whereas, owing to the disproportionately large head and shoulders, with their abundant coat of long hair, it has an ungainly and top-heavy appearance. In stature it is by no means the equal of its European cousin, the shoulder-height of a well-grown bull being about 5 feet 9 inches, while cows are considerably smaller. In colour the American species is much darker than the European, the coat being blackish brown, passing into black on the long hair of the head and fore-quarters. Characteristic features are to be found in the great mass of hair on the crown of the head and chin of adult bulls, as well as the heavy fringes on the upper half of the fore-legs. The shedding of the winter coat in large blanket-like masses is even more marked in the present than in the Old World species; and in summer the coat on the hind half of the body is quite short and devoid of curl. The horns are relatively short and sharply curved, and in old bulls—which are then known as “stub-horns”—generally become much worn down

and blunted. Well-grown horns usually measure from 16 to 18 inches in length, although these dimensions are in some cases exceeded by a couple of inches or so. The horns are also set lower down on the head than in the European bison; and the skull differs from that of the latter by the greater convexity of the forehead, and the still more tubular form of the sockets of the eyes. There are fourteen pairs of ribs.

In the days of its prime the American bison ranged over the area lying between the Rocky Mountains and the Alleghenies, and from Mexico northwards to the Peace River; but its head-quarters were the grassy prairies extending from the Saskatchewan valley to the Rio Grande.

The wood-bison is a rather larger animal than the bison of the prairies, and has somewhat more slender horns, both of which features may be indicative of closer affinity with the European species. It is mainly by this race that the American bison is represented at the present day in a truly wild condition. In an article published some years ago in the *Asian* newspaper it was stated that—

“A few years ago wood-buffalo were found over a very much larger area than at present, for we hear of them having been killed as far west as Fort St. John and Fort Liard, along the foot-hills of the Rocky Mountains, eastward across the Slave and Athabasca Rivers, and southward toward the higher land. That they were very rare as far north-west as Fort Liard is shown by the fact that in 1866, when the tracks of one bull were seen by the Indians about twenty miles north of the post, they did not know what it was, and were afraid to shoot it, until a man

from the south came to the place and went out and shot it. There is a general opinion that they never went farther north than Great Slave Lake; but among the records of the Hudson's Bay Company at Fort Simpson there is an item which appears in the journal for the year 1835, showing that during the winter six wood-bison were killed by the hunters on the east side of the Mackenzie River, near Marten Lake, and nearly 100 miles north of the outlet to Great Slave Lake. But this is the only case on record, and it probably refers to a herd that strayed farther north than usual. Some years ago there was a small band of a dozen or twenty to the south of the Peace River, near Fort McMurray; but recently they have not been heard of, and have probably been killed off, and at present the only place where they are found is in the country north of the Peace River and south of Great Slave Lake, between the Slave River and the Caribou Mountains, and particularly on the Salt Plain near the brine-springs. . . .

"The greater part of the country is densely wooded, with the usual northern forest of spruce, poplar, tamarac, and birch. The small openings dignified by the name of prairies are rather scattered, and are usually only 200 or 300 yards in length; but it is on these that one is likely to come across the bison. The Salt Plain, which covers an area of perhaps seventy-five square miles, and takes its name from having several brine-springs situated near the centre, is not an unbroken stretch of prairie-land, but is dotted here and there with clumps or groves of poplar. Part is covered with a luxuriant growth of grasses and various flowering plants, and looks very beautiful when these are in bloom; and part is barren

and alkaline. It lies only a few miles west of the Slave River, and some years ago was the favourite feeding-ground of the bison, which came to lick the salt. Bears and moose still frequent the neighbourhood of the brine-springs, but the bison have gone farther inland, and little trace of them is left but a few bleached skulls."

The history of the extermination of the bison of the prairies was described in great detail by Dr. W. T. Hornaday¹ in 1887; and as this account has been frequently quoted by subsequent writers, its repetition here is unnecessary. Dr. Hornaday estimated the number of living survivors of the species in the year 1886 at 1091, of which 256 were in captivity and 835 running wild in British North America, the Yellowstone Park, and a few other localities. In 1890 Mr. Mark Sullivan attempted to make a fresh census of the species, the results of which formed the subject of an article published in the *Boston Evening Transcript* of 10th October 1890.

As the result of his inquiries, Mr. Sullivan estimated the number of bison living at that time as approximately 1024, of which 684 were in captivity and 340 running wild or half wild. His inquiries appear to have been conducted with great care; and in the case of the greater number of confined herds—whether American or foreign—the numbers are practically accurate. The number of those running wild in the neighbourhood of the Great Slave Lake was, however, arrived at by a process of "averaging"; and the extent of the herd in the Yellowstone is to a large degree a matter of guesswork. Another

¹ "The Extermination of the American Bison," *Rep. U.S. Nat. Museum*, 1886-87, pp. 369-348, Washington, 1889.

element of uncertainty was introduced by the alleged existence of wild bison in the mountains of Colorado; for while a government official vouched for their occurrence in considerable numbers, old bison-hunters were very sceptical whether there were any at all. Admitting that the report of their existence in that district might be true, the author allowed 21 as their conjectural number. It was added that reports of wild bison in other parts of the United States were fabrications.

The largest herd of pure-bred domesticated bison at that time living in the United States was one formerly belonging to Mr. C. Allard, which ranged over the Flathead Indian Reserve in Montana, and numbered 259 head. Next to this came the herd of Mr. Jones Goodnight, in Armstrong County, Texas, with a total of 110 head.

Whatever may have been the real number of wild bison at that time, it is evident from the figures given above that they had decreased very seriously since 1887, while those living in captivity exhibited, on the other hand, a marked increase in numbers. Although the bison in the Yellowstone are protected so far as possible from poachers, many of them fall victims to beasts of prey, and their rate of increase seems to be slow. Those in British territory were at that time much harried by Indians, and were in consequence rapidly decreasing in number.

Another census was taken in 1894, when the total number of bison was estimated at 1233, against 1024 four years previously. The wild herd in the Yellowstone Park was put down at 30 head, whereas in 1890 it was stated to include between 300 and 400.

Passing over several partial or complete censuses

taken between 1894 and 1910, reference may be made to the account published in the latter year by the American Bison Society.¹

According to this report, the condition and prospects of the three herds of bison maintained by the Government of the United States are all that can be desired, and, in the opinion of Dr. Hornaday, the future of the species is now secured. These herds comprise one in the Yellowstone Park, with ninety-five head, a second in Wichita, with nineteen head, and a third in Montana, with forty-seven head, the total number of animals thus being 161. Of these herds the one in Montana, which occupies a tract of twenty-nine square miles, has only recently been brought together (as described in the report), and promises to be the best of the three. Indeed, Dr. Hornaday is of opinion that this herd alone would be amply sufficient to safeguard the species against extinction, since, owing to the extent of the area on which it is established, it is secure against any ill-effects from in-breeding. Regarding the Yellowstone herd, Dr. Hornaday is less confident, as the relatively small tract on which it is kept may eventually lead to deterioration, or even extinction. The Wichita herd, on the other hand, is as well situated as the one in Montana.

In another part of the report is given a census of the total number of pure-bred bison living in captivity in America on 1st May 1910. This total is 1633, against 1592 in 1908, and 1010 in 1903, thus showing a well-marked and progressive increase. Out of the 1633, 626 are in Canada, and the remaining 1007 in

¹ *Third Annual Report of the American Bison Society, 1909-1910*, Boston, 1910.

the United States. In 1903 Canada was estimated to possess only forty-one head, the enormous increase being apparently due to the transference of the Pablo herd from the United States. Of wild bison the total number is estimated at 475, of which twenty-five are in the Yellowstone, and the remaining 450 in Canada. In 1908 the number of wild Canadian bison was estimated at 300. The grand total of pure-bred animals living in North America at the date mentioned was thus approximately 2108, against 1917 in 1908.

The name buffalo is the English equivalent of the Italian *bufolo* or *bufalo*, which is itself apparently derived from the Latin *bubalis*. The last name, as mentioned in an earlier chapter, seems to have been originally the designation of the bubal hartebeest (*Bubalis boselaphus*) of North Africa, but was applied by early writers, at all events in some cases, to the aurochs. Later on, when the domesticated breed of the Indian arna, or buffalo, was introduced into Italy—probably about the year 600¹—the name seems to have been transferred to that animal. Buffalo, therefore, is properly applicable to the Indian arna (*Bos* [*Bubalus*] *bubalis*), as distinct from the African species. Buffaloes differ from all the cattle hitherto mentioned by the triangular section of a large portion of their wholly black horns, the smooth tips alone being circular or nearly so. When these smooth, cylindrical tips are worn down by use, nearly the whole of the horn becomes of the triangular type. The horns arise low down on the skull, but as their basal portion—especially in the African species—is often much expanded, it may extend close up to the occiput.

¹ *Vide supra*, p. 61.

The forehead is highly convex and vaulted. When fully adult, buffaloes have the hide but sparsely covered with hair, while in old age it may be almost bare. Other characteristics of buffaloes are the large ears, which may be thickly fringed with long hair, the broad muzzle, the short, deep neck, heavy body, in which the line of the back is nearly straight, without any ridge or hump on the withers, the short, thick limbs, and the moderate length of the tufted tail. All the species appear to have thirteen pairs of ribs. The larger kinds are bulky, ungainly animals, which differ from other wild cattle in their partiality for wallowing in mud, or standing up to their necks in water. They associate in herds which may number hundreds of individuals; and they are, for the most part, surly and ferocious in disposition. Although fawn-coloured buffaloes are known in India, and red ones common on the west coast of Africa, black is the characteristic buffalo-colour; and it is particularly noteworthy that in most cases this specialised sable livery is common to both sexes.

The arna or wild Indian buffalo is so like a large edition of some of the domesticated breeds of the species, of which two portraits are given on Plate XIX, that it will be unnecessary to give a figure in this place. As a species, the Indian buffalo is characterised by the long and relatively narrow head, and the great length of the horns, which taper regularly from base to tip, and are separated from one another by a wide space on the forehead; their direction is largely outwards, but, as will be noticed later, there is a racial difference in this respect. The ears are relatively narrow, and not bordered with a fringe of long hairs. Black is the normal colour,

although fawn or dun-coloured buffaloes occur in Assam. The latter have been regarded as representing a distinct race, although it seems more probable that they are merely individual variations. A fine bull buffalo will stand about 6 feet, or perhaps rather more at the shoulder. The maximum dimensions attained by the horns are noticed later.

The home of the wild buffalo is in the tall jungles of elephant-grass in various parts of India and Ceylon, in which these gigantic animals are as completely hidden as are rabbits in an English meadow of standing grass. From many parts of India buffaloes have been more or less completely exterminated, but they are still abundant in Assam, and the adjacent state of Cooch-Behar. Wild buffaloes likewise occur in the jungles of portions of Burma and the Malay Peninsula, but whether these are aboriginally wild, or the descendants of domesticated herds which have run wild, is uncertain. In earlier times the species ranged much farther to the westward than is the case at the present day; and there is evidence, as mentioned in Chapter IX, that it once extended through Persia into Mesopotamia.¹

In Assam there are two distinct types of the Indian buffalo—one characterised by the subcircular or lunate sweep of the horns, and the other by the horizontally outward extension of these appendages, which are directed upwards only at their extremities, and attain enormous dimensions in old bulls. Buffaloes with horns of the circular type are the common form, and occur in Cooch-Behar and other parts of India; but those of the straight-horned breed are definitely known in India only from Assam.

¹ *Supra*, p. 181.

The great straight-horned buffalo of Assam is represented in the collection of the British Museum by a pair of detached horns and a skull with horns of bulls, and the skull and horns of a cow. The two detached horns were discovered about the middle of the eighteenth century in a cellar at Wapping by a patient of Sir Hans Sloane, to whom they were given in lieu of a fee; they came into the possession of the British Museum at its foundation in the year 1753, with the rest of the Sloane collection, and are by far the longest on record, each measuring $77\frac{1}{2}$ inches in length along the curve, so that the span of the pair would have been about 14 feet. The skull and horns are those of a bull killed by Colonel J. Matthie on 8th April 1842, in Assam, and presented to the Museum by their owner in 1855. They are figured by Dr. J. E. Gray in the *Proceedings* of the Zoological Society for the latter year (pl. xl.), and measure $65\frac{3}{4}$ inches along the curve. The horns of cows are of the same general type, but very long and slender.

There was at one time an idea, although not among most naturalists, that horns of the straight type are those of cows, and those of the lunate type bulls. This, however, is disproved not only by the enormous size of the two pairs of horns, whose history is given above, of the straight type in the British Museum, but likewise by the occurrence of stout and slender modifications of both types, the former belonging to bulls and the latter to cows.

Apparently the *Bos bubalis* of Linnæus is the tame Indian buffalo, and from this the circular-horned wild race differs so slightly that both may be included under the title of *B. bubalis typicus*. In 1792, however, Kerr, in his edition of the *Systema Naturæ* of

Linnæus, proposed the name of *B. arnee* for the wild Indian buffalo, which would be a synonym of *B. bubalis* if the latter be taken to include the wild form.

It is true, indeed, that in 1827 Colonel Hamilton Smith, in the fourth volume of the *Animal Kingdom*,¹ proposed to restrict the name *B. arni* (as he spelt it) to the large straight-horned race, suggesting that the Sloane pair of horns in the British Museum might be taken as a typical example. On page 30 he is, however, a little more definite, stating that there is a race of buffaloes in India, with the horns opening 10 feet; it is called *arni* in Hindustan, and is the *B. arni* of Shaw. Again, on page 389 he states that during a shooting trip a party of officers killed several wild buffaloes, but only one *arni*. The late Dr. Gray, in the above-mentioned volume of the Zoological Society's *Proceedings*, seems to have adopted, at least temporarily, the same view, as he figured Colonel Matthie's specimen as the *B. arnee* of Hamilton Smith. From what has been stated above as to that name being a synonym of the typical buffalo, it appears that its employment for the straight-horned race is inadmissible.

Accordingly, it is necessary to adopt a name proposed by Mr. Brian Hodgson in the *Journal* of the Asiatic Society of Bengal for 1841 and 1847.² In these passages Hodgson suggested the name *spirocerus* for the circular-horned, and *macrocerus* for the straight-horned type, remarking that in his opinion the two forms certainly indicated distinct varieties, and possibly distinct species. The first of these two names is a synonym of *typicus*, or at all events *arni*; but the second is available for the large straight-

¹ Pp. 389-392.

² Vol. x. p. 912; vol. xvi. p. 710.

horned Assam buffalo, which may therefore be called *B. (Bubalus) bubalis macrocerus*. It may be added that the fossil buffalo of the Narbada Valley, for which in 1859 Falconer proposed the name *B. palæindicus*, appears to be inseparable from the straight-horned Assam race, having the same type of horns and skull. If this view be correct we have evidence of the former existence of that race so far south as the Narbada Valley, which is a matter of considerable interest from a distributional point of view. Hamilton Smith stated that in his time this splendid animal was found only in the upper eastern provinces and at the foot of the Himalaya, but cited evidence to show that it previously occurred in the Rhamghur district of Bengal. It would thus seem that the race gradually died out in the south till it finally survived only in some part of Assam, from which, as already mentioned, it may now be exterminated.

Although the straight-horned type is definitely known in a truly wild condition only from the jungles of Assam, it is probable that in former days it may have been more widely spread; and it is important to notice in this connection that some years ago I received a photograph of two pairs of arna horns from the Malay Peninsula, one of which comes very close to the straight Assam type. Whether these specimens belonged to aboriginally wild buffaloes or to the descendants of individuals escaped from captivity is, however, a matter of uncertainty.

A somewhat similar degree of uncertainty obtains with regard to the buffaloes found wild in parts of Borneo, although in my work on *Wild Oxen, Sheep, and Goats*¹ I ventured to regard them as representing

¹ London, 1898, p. 126.

a distinct local race of the arna, under the name of *B. bubalis hosei*. These buffaloes are smaller than the typical arna, and show a narrow white gorget on the throat, their legs, as seems to be generally the case in the latter, being white from the knees and hocks downwards, with the exception of a small triangular dark patch on the fetlocks.

Although dwelling in the aforesaid tall grass-jungles in herds, wild Indian buffaloes frequently leave the protection of this covert in the early mornings to appear on the broad stretches of sand in the wide river-beds in order to drink and wallow in the water. When the grass-jungles are in their full luxuriance of growth, buffaloes can only be hunted with any approach to safety from the backs of elephants; but in the Central Provinces the grass dries up and becomes less impenetrable during the hot season, or is burnt by the natives; and under such conditions buffalo-stalking on foot, although by no means free from danger, is practicable.

The following excellent summary of the habits of the Indian buffalo is given by Dr. W. T. Blanford¹:—

“The wild buffalo keeps chiefly to level ground and is generally found about swamps. It haunts the densest and highest grass-jungle or reeds, but is also found at times in open plains of short grass, or amongst low bushes, but very rarely in tree-forest. Buffaloes associate in herds, often of large size. I have seen fifty together, and have heard of much larger assemblages. They feed chiefly on grass, in the evening, at night, and in the morning (probably morning and evening as a rule), and lie down, generally in high grass, not unfrequently in a marsh,

¹ *Fauna of British India—Mammalia*, London, 1888-91, p. 493.

during the day; they are by no means shy, nor do they appear to shun the neighbourhood of man, and they commit great havoc amongst growing crops. Sometimes a herd or a solitary bull will take possession of a field and keep off the men who own it. In fact buffaloes are by far the boldest and most savage of the Indian *Bovidæ*, and a bull not unfrequently attacks without provocation, though, probably on the principle that a council of war never fights, a herd, although all will gallop to within a short distance of an intruder and make most formidable demonstrations, never attacks any one who does not run away from them. A wounded animal of either sex often charges, and has occasionally been known to knock an elephant down. Buffaloes retain their courage in captivity, and a herd will attack a tiger or other dangerous animal without hesitation, and, although gentle with those they know, and greatly attached to them, they are inclined to be hostile to strange men and strange animals. Whether wild or tame they delight in water, and often during the heat of the day lie down in shallow places with only parts of their heads above the surface."

The island of Mindoro, in the western half of the Philippine group, is the home of a stoutly built black buffalo intermediate in size between the Indian species and the under-mentioned anoa, which is known to the natives as the tamarao, and was described in 1888 by a missionary resident in China—Père Heude—as a distinct species under the name of *Bos*, or rather *Bubalus*, *mindorensis*. Subsequent to that date an opinion was expressed that, in place of a species, it might be a fertile hybrid between the Indian buffalo and the anoa. Be this as it may, the



FIG. 1. A PAIR OF YOUNG ANOAS



FIG. 2. A YOUNG BULL ANOA

tamarao resembles other Asiatic buffaloes in having the hair on the middle line of the neck and back directed forwards, instead of backwards, as far as the loins, where a whorl marks the change in the slope. Standing about $3\frac{1}{2}$ feet in height at the shoulder, this buffalo is clothed with a relatively thick coat of blackish brown hair, marked in some instances with a white gorget on the throat. The horns, which are relatively short and massive, approximate in character to those of the circular-horned race of the arna. Another small buffalo, from the island of Calamianes, in the Philippines, has been described by Dr. A. Nehring¹ as *B. mællendorffi*.

Whatever doubt may exist as to the right of the Mindoro buffalo to represent a species, there can be none in the case of the anoa or pigmy buffalo (*B. depressicornis*), of the island of Celebes, which is the smallest of all wild cattle, being of about the same size as the dwarf Gaini domesticated humped cattle of India, and standing only about 3 feet 3 inches at the shoulder, although rather higher at the loins. Despite its slender build, as compared with larger cattle, its small, neat ears, and upwardly-directed horns, which incline upwards and outwards in the plane of the face, without any distinct curvature, the anoa is essentially a buffalo, whose affinities are with the Indian species. The horns, for instance, are triangular and of the same general type as in the arna; and if the Philippine tamarao be a valid species, the gradation from the form characteristic of the arna to that of the anoa is practically complete. The direction of the hair on the middle line of the

¹ Sitzber. Ges. naturfor. Freunde, Berlin, 1894, p. 185.

neck and back is the same as in the Indian buffalo. The relation of the anoa to the arna is, in fact, very similar to that presented by the pigmy hippopotamus of western Africa to its gigantic relative the ordinary hippopotamus; and if the various species of wild cattle are divided into subgeneric, or generic, groups it scarcely seems necessary to separate the anoa from *Bubalus*, as typified by the Indian buffalo, although it has been made the type of a genus by itself under the name of *Anoa depressicornis*, or *A. celebensis*.

On the other hand, while some anoas are wholly black, others, as shown in the accompanying illustration, have a pair of white spots on each side of the face, a white band on the chest, and white markings on the legs, more especially the front pair. Such markings, with the exception of the chest-band, which may occur, as already mentioned, in the tamarao and the Bornean race of the Indian buffalo, are quite unknown in any other wild cattle; and it is very noteworthy that the two spots on the sides of the face are almost identical in position with those found in the bushbucks (*Tragelaphus*) among antelopes. Whether, however, such slender evidence can be regarded as indicative of a near genitive relation between buffaloes—which, be it noted, are the most primitive and generalised of all cattle—and the antelopes of the bushbuck group must, for the present at any rate, remain an open question.

Full-grown anoas have quite short and sparse coats, as shown in the left-hand figure of the first of the two photographs here reproduced; and in old age even this scanty covering may, as in the larger buffaloes, more or less completely disappear. Young

anoas, on the other hand, are clothed in a dense coat of woolly hair, which, as shown in the right-hand figure of the same illustration, is in due course shed in large fleecy masses. This juvenile coat may be either blackish or bright golden brown, the brown tint persisting in some at least of the cows of the white-spotted type. The tails of these spotted anoas appear to be shorter than in a black specimen in the British Museum, in which the tuft reaches the hocks.

The existence of anoas with bright brown juvenile coats, and a brownish dress in at least some of the adult cows, was first made known to me in 1905 by the specimens shown in the photographs, which were at that time living in the Government Gardens at Trivandrum, on the Travancore coast of Madras; and in the same year I tentatively regarded them as indicating a race apart from the wholly black anoa under the name of *B. depressicornis fergusonii*,¹ in honour of a former director of the Trivandrum Museum and Gardens. As Celebes is a large island, extending over eight and a half degrees of latitude and embracing an area of over 3300 square miles, it may, therefore, as was long ago pointed out by Dr. K. M. Heller,² well be the home of two distinct types of anoa, each limited to a particular district.

Of the habits and mode of life of the pigmy buffalo comparatively little is known. It has, however, been ascertained that those tiny cattle are mainly, if not exclusively, restricted to the mountainous portions of their native island, where they

¹ *The Field*, London, vol. cvi. p. 378, 1905.

² *Die Urbuffel von Celebes*, Anoa depressicornis, Dresden, 1889.

inhabit the woods. For the greater part of the year they associate in pairs, like bushbucks, and unlike other buffaloes; but in the breeding season the cows separate from the bulls, and give birth to their calves amid thick covert. In habits they are exceedingly wary and difficult to discover, and I can find no record of any having been killed by European sportsmen. Anoaas have the same characteristic odour as other buffaloes, and likewise conform to the habits of the rest in their partiality for shade and water, and likewise by drinking in long draughts, instead of in short gulps after the fashion of antelopes.

The last representative of the living species of wild cattle, and thus of the ox tribe in general, is the African buffalo (*Bos caffer*), which, under all its numerous phases, is a very different-looking animal to its Indian cousin. The typical representative of the species is the great black buffalo of southern Africa, which stands, in the case of adult bulls, from about 4 feet 8 inches to 5 feet at the shoulder, and is easily recognised by the enormous development in the same sex of the bases of the much flattened and receding horns, which form a large helmet-like mass on the forehead, separated from one another by a very narrow strip of hairy skin. From this great frontal shield, whose surface is very rough and irregular, the horns spread at first in an outward and backward direction, and then sweep sharply inwards and somewhat forwards, to terminate, when unworn, in sharp and nearly cylindrical points. Owing to this bold curvature, the middle portion of the horn, just before the commencement of the inward bend, lies in a plane far behind not only that of the frontal helmet, but likewise of that of the forehead

itself. Other characteristic features are to be found in the large size of the flapping ears, which are heavily fringed at the margin with long hair, the relative shortness of the face, and the circumstance that the hair (when any remains) along the middle line of the neck and back is directed uniformly backwards from the head to the root of the tail.

Buffaloes conforming more or less closely to this type, but generally with a minor development of the helmet-like expansion of the bases of the horns—which consequently become much flattened, as in *B. caffer radcliffei* of Uganda—extend northwards through eastern Africa to Abyssinia; and there can be little hesitation in regarding all these animals as nothing more than local races of the great southern species, in spite of the circumstance that in some of them the hair shows a more or less decided tendency to become brown.

On the other hand, in Ashanti and neighbouring countries of the west coast, in place of these huge black buffaloes, with their closely approximated and frequently helmet-like horn-bases, and long receding horns, we meet with a small dun-red buffalo, locally known to Europeans as the bush-cow, and standing only between $3\frac{1}{2}$ and 4 feet at the shoulder, with relatively short and more or less upwardly-directed horns, of which the bases, although flattened, do not form a helmet-like mass, and are separated from one another by a considerable interval, while their middle portion is in front of rather than behind the plane of the forehead.

If we had only the big black Cape buffalo and the dwarf red Ashanti or Congo buffalo to deal with, there would be little hesitation in regarding them as

distinct species, as indeed was the view taken by the older naturalists. But it happens that in various parts of western and central Africa there occur a number of different types of buffaloes which collectively serve to form an almost complete gradation from the large black to the small red animal; and it accordingly seems the most logical course to regard all these local variations as representing races or phases of a single exceedingly variable species.

Support to this view is afforded by the circumstances that analogous variations occur in other groups of African big game animals. Giraffes, for instance, are characterised by the pure white lower portions of the legs and the strong development of the unpaired frontal horns in the north of Africa, whereas in the south they have fawn-coloured and spotted legs and a rudimentary frontal horn, while in the intervening districts intermediate conditions obtain in these respects. Consequently, all these phases are regarded as referable to a single species. Again, the difference between the black-and-white striped Grant's bontequagga, or zebra, of north-eastern Africa, with its legs striped down to the hoofs, and Burchell's bontequagga, or zebra, of southern Africa, in which the legs are white and unstriped, while the body-markings consist of chocolate stripes on an orange-tawny ground with fainter intermediate "shadow" stripes, is enormous; and yet these two extremes are so inseparably connected that they cannot be regarded otherwise than as local races of one and the same species. Much the same state of things obtains in the case of the local forms of bushbuck.

In a continent of the size of Africa—a size not

fully appreciated by most of those who have not travelled there—where there is more or less free communication between all parts, it is only natural to expect that species of animals should display local variations of this nature, according to the exigencies of their surroundings, or from other causes with which we are at present unacquainted.

On the foregoing view the dwarf red buffalo should be known as *B. caffer nanus*, the third name having been originally applied to a detached pair of horns from the west coast, formerly in the collection of Gresham College, but now in the British Museum. Unfortunately, their exact place of origin is unknown, so that the typical locality of the race they represent must always remain unknown. In an earlier chapter it has been shown that red is the primitive or generalised, and black the specialised, type of colouring among cattle; and the dwarf Congo buffalo may accordingly be regarded as representing the primitive, and the black Cape buffalo the most specialised, phase of the species; but it must not be assumed that the one is the ancestor of the other, as the small forms may be degraded (see p. 265).

As regards the races connecting the black Cape and red Ashanti, or Congo, phases of the species, these are so numerous and some of them so unsatisfactorily defined, that it would be merely wearisome to give a complete list.¹ Accordingly it will suffice to refer to a few of those which are of special importance in showing the gradation from the two extreme types.

Before referring to these it will, however, be well

¹ A list—complete to the date of writing only—will be found on page 70 of my *Game Animals of Africa*, London, 1908.

to mention that the African buffalo, throughout its manifold variations in size, colour, and the shape of the horns, is always distinguishable at a glance from any of the Asiatic members of the group by the uniformly backward direction of the hair on the middle line of the neck and back, and likewise by the large and heavily fringed ears; while in all cases the horns have their front basal margins much expanded in the vertical direction, and more or less approximated to each other.

As already mentioned, in the Ankoli or Uganda race of the species the horn-bases are much flattened, although the horns themselves retain the backward flexure characteristic of the typical southern buffalo. In the neighbourhood of Lake Kivu, which lies due west of the Victoria Nyanza and south-south-west of the Albert Nyanza, there occurs, however, a member of the group of short-horned buffaloes, which has been named *B. caffer matthewsi*. In all this group the horns are relatively short, and directed outwards at first nearly in the plane of the forehead, so that they lack the marked backward recession of the middle portion characteristic of the large-horned races. In the Kivu buffalo the colour of the skin and hair is black, with a white tail-tip, and the horns are separated on the middle line of the forehead by a comparatively narrow strip of skin.

Not very far away from the Kivu buffalo occurs a specially interesting race, which typically inhabits the Semliki Forest, and is characterised by the red colour of the hair in immature individuals of both sexes, although fully adult bulls appear to become blackish brown. Cows, on the other hand, may be permanently red, although this is not definitely

ascertained. This buffalo (*B. caffer cottoni*) is of rather large size; and in respect of colouring forms a step in the direction of the small orange-red Ashanti race, although the horns are to a great extent miniatures of those of the black Cape buffalo, except that they do not apparently meet at their bases.

An apparently very similar buffalo is met with on the opposite side of the great equatorial forest in the interior of French Congo. In the head of a young bull of this buffalo in the British Museum the colour of the hair is darker than in an Ashanti specimen of *B. c. nanus*, its general tint being tawny brown, tending to blackish on the muzzle and chin. But the most characteristic feature is the colour of the thick fringe of long hair on the ears. At the base of the upper edge these hairs are light yellowish chestnut; but on the rest of this margin, and also on the lower edge, they are black, with two small flecks of straw-colour near the middle of the lower border, and a larger patch near the base.

In the autumn of 1900 I saw the head of an adult, although not old, bull from the same region, in which the colour of the hair was bright red, while the horns were of the general type of those of the Cape buffalo, although smaller, and separated by a considerable interval at the base. Whether the bulls of these buffaloes turn blackish when older, I have no information. If they do, the French Congo buffalo may be identical with the one from the Semliki; but if not, it must be distinct.

In the *Field* newspaper for 1910¹ I gave a notice of certain buffalo-heads obtained by Mr. M. W. Hilton-

¹ Vol. cxv. p. 156.

Simpson on the left bank of the Kwilu River in the Belgian Congo. This river, which rises in Portuguese territory, runs nearly due north, and discharges into the Kwango, a tributary of the Kasai, which forms the most important affluent of the Congo. In the heavily fringed ears and general form of the horns the Kwilu buffalo approximates to the dwarf reddish *B. c. nanus*, but the horns of the largest bull killed by Mr. Simpson exceed in size any of the latter race of which measurements have been recorded, the right horn measuring $25\frac{3}{8}$ inches along the outer curve, and the left one $24\frac{1}{2}$ inches, the basal girth of the former being $16\frac{1}{2}$ inches, its maximum width $6\frac{3}{8}$ inches, and the expanse from tip to tip $13\frac{1}{2}$ inches. In the largest cow the left horn measures 15 inches in length, with a girth of $9\frac{1}{2}$ and an expanse of $8\frac{3}{4}$ inches. The horns incline upwards nearly in the plane of the face, and are more approximated at their bases than in the dwarf red buffalo. The colour of both cows and bulls is a pure brown, and thus much darker than the tawny red of *nanus*; the young only agreeing approximately in hue with the latter, and the cows being fully as dark as the bulls. Except in the bull of which the head is here figured, the fringes of the ears are tinged with tawny, with one white lock. In size the Kwilu buffalo slightly exceeds the specimens of the red race mounted in the British Museum.

That the Kwilu buffalo, which I have named *Bos caffer simpsoni*,¹ is distinct from *B. c. nanus*, whose habitat includes Nigeria, Ashanti, and Sierra Leone, is indicated by its darker colour and larger and more approximated horns, the form of which does not agree with those of the latter.

¹ *Proc. Zool. Soc. London*, 1910, p. 993.

As remarked in the original description, the Kwilu buffalo evidently forms a connecting-link between *B. c. nanus* and the short-horned blackish races of *Bos caffer*, as exemplified by a pair mentioned by Dr. Graham Renshaw in the Zoological Society's *Proceedings* for 1904, p. 130, as being then living in the Antwerp Zoological Gardens. Those animals appear to have had horns of the same general type as those of the Kwilu race, but their general body-colour was much darker, being described as dark blackish brown; the ears show similar heavy fringes. As suggested by Dr. Renshaw, these buffaloes may have been the Senegambian *B. c. planiceros*.

Certain buffaloes killed in 1910 by Mr. Russell Roberts in Senegambia are much larger than any of the named races from the more southern districts of the west coast, and have horns of a more spreading type than the red dwarf buffalo, although exhibiting a similar wide separation of the bases on the forehead. They occur in large herds, and old bulls have a horn-spread of 30 inches. In the cows and young bulls the colour of the hair is reddish dun-brown, but in the bulls it gradually darkens until it finally becomes black all over with the exception of the ears, some spots near the eyes, and the whole of the under-parts, from the chin to the tail, which are light red. One of the bulls was in an intermediate stage of colouring, showing a considerable amount of brown on the face. These Senegambian buffaloes belong, apparently, to a race previously known only by the horns, *B. c. planiceros*. They form a closer connection between the dwarf red buffalo and the brownish black buffaloes of eastern central Africa.

Another type of the short-horned group is repre-

sented, as I have stated in the *Field* newspaper,¹ by buffaloes shot by Lieutenant H. J. L. Thompson in the Yala country, between the Aloda towns of Echimoga and Iveku-Okuku, in an open grassy district well watered by numerous streams flowing into the Yahé River. Except on the banks of that river, where the covert is very dense and the ground swampy even at the end of the dry season, there are few trees in the district. At the spot where the buffaloes were killed the river forms a U-shaped bend about six miles across; and the herd was crossing the open grassy ridge in the middle of the bend. The district is scored with buffalo-tracks of two sizes, the smaller evidently made by the dwarf race. The herd comprised from about twenty to thirty animals, all of which, with the exception of one calf, were nearly equal in size. The adults were, however, of two colours, some deep glossy black, and the others dun or khaki-colour. The calf appeared to be darker, and all, inclusive of the calf, had light-coloured "stockings." Both before and after firing Mr. Thompson had the herd under observation for a considerable time, at distances ranging from 400 to 30 yards, and he was able to identify three bulls, which were black. The cow killed was entirely black, with the exception of a slight brownish tinge at the tips of the ears and along the middle line of the neck and back, and of the dirty creamy grey of the legs below the knees and hocks. The height at the withers was estimated at between 3 feet 6 inches and 4 feet, the legs being very short and massive. Mr. Thompson identified a large number of dun or khaki-coloured animals, which appeared to be all

¹ Vol. cxv. p. 1112, 1910.



FIG. 2. SKULL AND HORNS OF LAKE CHAD BUFFALO



FIG. 1. HEAD OF KWILU BUFFALO

cows, although some may have been young bulls. The cow shot was khaki-coloured, with the sparse hairs rufous, and the lower portions of the legs similar in colour to those of the bulls. Numbers of skulls of this race are to be seen among the piles accumulated by the Yala people at the entrance of their villages, but the heaps also contained skulls of a larger buffalo. A cow of this larger form was killed by Captain Galloway, near Amachi, twenty-eight miles distant from the spot where Mr. Thompson shot his two dwarf specimens. At the end of December 1909, or the beginning of the following January, Mr. Thompson killed, out of a herd of fifteen, a bull buffalo much larger than the Yala race. All the members of the herd were of a uniform dark rufous colour, with the lower portions of the legs somewhat lighter. These larger buffaloes stand from 8 to 10 inches higher at the shoulder than the Yala race. The idea that there are two races of buffaloes in this district is confirmed by the natives of the country.

The small Yala buffaloes evidently represent a race in which the bulls are black and the cows dun, thereby affording another connecting-link between black and red buffaloes.

Yet another type of short-horned buffalo is the Lake Chad buffalo (*B. c. brachyceros*), definitely known only by the skulls of a bull and cow brought home from the Bornu country in the early part of last century by the explorers Denham and Clapperton. The skull of the bull is characterised by the shortness and generally small size of the horns, which are separated from one another by a wide gap in the middle line of the forehead, and show no distinct expansion at the base. The basal half of the horns

presents a nearly flat front surface, and ascends upwards and outwards at an angle of almost exactly 45° with the middle line of the skull; beyond this there is a regular but sharp curve inwards, so that when unworn the tips, as in the type specimen, incline towards the middle line in a horizontal direction. It is possible that certain greyish buffaloes from western Africa may be referable to this race.

As to the precise locality where this so-called Lake Chad buffalo was obtained, there is no definite information, the original description merely mentioning "central Africa": accordingly, the spot may well have been scores of miles distant from the lake.

Comparisons might be carried still further; but the foregoing instances are sufficient to indicate how close is the connection and complete the gradation between the great black buffalo of South Africa and small dun-red one of Ashanti and other parts of the west coast. The following notes on the habits of the large black buffaloes of South Africa are condensed from an account written by Mr. F. C. Selous.

In South Africa buffaloes calve from January to March. The calves are reddish brown when newly born, but, as they grow, the red tinge gradually disappears, when they become dun-brown, not turning black till they are nearly three years old. When in their prime, buffaloes are covered with a fairly abundant coat of coarse black hair, while the large drooping ears are edged with long fringes of softer hair. The tuft at the tip of the tail, though well developed, is not so thick or so wavy as in domesticated cattle. With age bulls and cows gradually lose their coats, at first along the back behind the shoulders, after which the baldness spreads till very old animals

become almost devoid of hair, and finally lose the fringes on the ears and the tail-tuft. In districts suitable to their habits, where pasture is abundant, buffaloes formerly consorted in herds of from 50 to 200 or 300 individuals, or even more.

Old bulls driven from the herds by younger and more vigorous males either live alone, or in twos and threes, although in districts where buffaloes are very numerous five or six of these bulls often associate. In hot weather buffaloes drink twice a day, early in the morning, and again late in the afternoon. In the cool of the evening and during the early part of the night they feed on grass and young reeds, then lie down till after midnight, rising to feed again towards morning. Soon after daylight they again drink, and then continue grazing until the sun gets hot, when they retire into thickets or forest to obtain shelter, and rest till late in the afternoon. In cold weather they drink once a day, usually just after dark. When undisturbed, buffaloes often lie all day long in the shade of trees on the banks of rivers; but when persecuted they retire to the densest thickets, and although never going far from water, often walk, after drinking, several miles in the bush, parallel with the course of a river, before lying down to rest. Where they have never been hunted, buffaloes are unsuspicious of danger and easy to approach against the wind. Old bulls, indeed, often almost refuse to get out of the way, but lie down or gaze unconcernedly at the sight of a human being, until he is within 50 yards, when one or two of a party of four or five may trot a few paces forwards to get a better view. I have never known bulls to charge under such circumstances. If you walk towards them, one will

turn and trot off sideways with its nose in the air, and then break into a heavy gallop, when the rest will follow. Old bulls are more inclined to charge when wounded than herd-animals, and young bulls when nearly full-grown are the readiest to resent ill-treatment. An old bull when disturbed, and standing with its nose upraised, gazing at the intruder, with eyes glowing beneath the massive horns, has, however, the appearance of a savage and dangerous animal, although, in most cases, it is merely ignorant and inquisitive. Pursuit causes them to give up this bold bearing, and they learn to run off so soon as they see a man approaching. No animal is more tenacious of life than a buffalo.

According to Major A. J. Arnold, the dwarf red buffalo in Nigeria frequents light open bush-clad country, well watered, with small belts of thick bush in which it can lie up in the daytime. The belt of forest beside the water-ways may be replaced by the thick dense bush of the big gullies of the plateau-topped hills of Nigeria. As a rule, they associate in pairs, with perhaps a calf; but near Lokoya, at the junction of the Niger and the Benue rivers, he came across a herd of twenty. They drink just before dawn, and then feed slowly either uphill towards the dense shady bush in the hillside gullies, or through the open scattered bush to some gully, in the recesses of which they lie up for the day.

It is added that the width of the interval between the basis of the horns diminishes as age increases, although it never becomes obliterated.

CHAPTER X

HYBRID CATTLE

THE species of cattle, when in a domesticated or semi-domesticated condition, are remarkable for the readiness with which many of them will interbreed, and likewise for the fertility of the hybrid progeny. Indeed, it is probable that under suitable conditions, all the species except buffaloes would interbreed, and produce fertile offspring; although it is noticeable that in some cases it is only the bulls of one species that will breed with the cows of a second, the opposite cross being infertile. It is likewise noticeable that the bulls are strongly prepotent, the hybrids generally, if not invariably, showing the characteristics of the species represented by the sire. In this fertility of the hybrids between different species cattle display a marked difference to certain members of the horse family when mutually crossed.

The wild species most nearly related to the extinct European aurochs and its domesticated derivatives are the gaur and bantin of the Indo-Malay countries; and since it has been shown in an earlier chapter that humped cattle are probably a domesticated form of the last-mentioned species, it would be natural to expect that European cattle should interbreed and produce fertile offspring with zebu. As a matter of fact, this

is actually the case; and it seems probable that many of the cattle of the Punjab are of this hybrid derivation, while Dr. W. T. Blanford¹ has suggested that the same holds good for those of eastern Persia. In the Punjab many of these presumed hybrids have lost the hump, although retaining the white ring round the fetlock characteristic of the zebu.

At Stellingen, near Hamburg, Mr. Carl Hagenbeck² has recently started a farm for breeding hybrids between European and humped cattle. One of the objects of this experiment is to produce a breed which shall be immune—as the zebu itself is said to be—to zymotic epidemic diseases, such as rinderpest. Another is to produce cattle of great stature and weight; and to effect this, very large zebu bulls are crossed with unusually big European cows. The opposite cross has apparently not yet been attempted. The steers, at any rate of the hybrids hitherto produced, are strikingly like their male parents, having well-developed humps, large pendent ears, and more or less white in the neighbourhood of the fetlocks. This indicates that the elimination of the hump in ancient Egyptian cattle, to which reference has been made in a previous chapter, must have been a long and slow process. The continuation of the Stellingen experiment and its results will be watched with interest.

The zebu is likewise nearly related to the gayal of north-eastern India, which, as pointed out in an earlier part of the present work, is probably a domesticated derivative of the gaur; and it is therefore natural to suppose that these two should freely interbreed. A female hybrid of this nature was born in

¹ *Eastern Persia*, London, 1876, vol. ii. p. 96.

² See *La Nature*, Paris, vol. xxx. pp. 111, 112, 1911.

1868 in the London Zoological Gardens, the sire being a zebu and the dam a gayal.¹ This hybrid cow was crossed five times subsequently with the zebu, and each time produced offspring. Later on she was crossed with a bull American bison, and in due course gave birth to a female zebu and gayal and bison hybrid, which was in turn again crossed with a bull bison, and produced offspring. Complete fertility is thus shown to have taken place in this series of crosses, in which the sire was at first a zebu but subsequently a bison. In the final cross the calf was essentially of the bison type.

The American bison has been frequently crossed in its native country with European cows, and the cross, like the resulting hybrids, has proved perfectly fertile; although all attempts to make bison cows breed with European bulls have proved unsuccessful. In these cross-bred cattle the characters of the male parent are dominant, a ten-months-old steer described and figured by Dr. W. T. Hornaday² being essentially a bison in appearance and characters. An adult hybrid cow depicted in the same volume is also very buffalo-like.

"The half-breeds," according to a correspondent quoted by Dr. Hornaday, "are very prolific. The cows drop a calf annually. They are also very hardy indeed, as they take the instinct of the buffalo [= bison] during the blizzards and storms, and do not drift like native cattle. They remain upon the open prairie during our severest winters, while the thermometer ranges from 30 to 40 below zero, with little or no food except what they found on the

¹ See A. D. Bartlett, *Proc. Zool. Soc. London*, 1884, p. 400.

² "The Extermination of the American Bison," *Rep. U.S. Nat. Mus.*, Washington, for 1886-87, p. 44, 1889.

prairie, and no shelter at all. In nearly all the ranching parts of North America foddering and housing of cattle is imperative in more or less degree; but the buffalo half-breed retains all its native hardihood, needs no housing, forages in the deepest snows for its own food, yet becomes easily domesticated, and consequently needs but little herding."

When this passage was penned it was considered that it would be profitable to breed these hybrid buffaloes as farm-stock; but I have not heard that the project has been continued, or, at all events, continued to any great extent.

That the American bison will breed with its European relative has been demonstrated in the preserve of Count Joseph Potocki at Pilawin, near Shepetowka, Volhynia, where a hybrid of this nature was born in 1909. I have, however, no information of other hybrids of this type, and cannot therefore say whether they are fertile.

According to Brehm¹ the European bison will not breed with domesticated cattle.

On the other hand, as mentioned in an earlier chapter, the Tibetan yak, which is no very distant cousin, will breed readily with humped cattle; and hybrids of this description are largely employed in the lower valleys of Ladak, both as beasts of burden and for agricultural purposes. According to Mr. F. Drew² these hybrids are the product of the bull yak and the cow zebu, the male of the crossbreed being known to the Ladakis as *zo* and the female as *zomo*. I have no information whether the hybrids are fertile *inter se* or with either of the parent species.

¹ *Tierleben, Saugetiere*, Berlin, 1891, vol. iii. p. 267.

² *The Jummoo and Kashmir Territories*, London, 1875, p. 246.

As regards buffaloes, Dr. W. T. Blanford¹ states that the Indian species never breeds with humped cattle; but whether this also holds good for the African species, and whether the latter will cross with its Indian cousin, I have no information. That the latter union might take place is very possible; but seeing that buffaloes differ much more widely from all other kinds of cattle than do the different species of the latter from another, it is quite probable that the African buffalo will not breed with either European or humped cattle.

The foregoing facts have a certain bearing on the systematic classification of the various members of the cattle group. It has often been held that such animals as will breed together and produce fertile offspring must be regarded as specifically inseparable; and the idea has been recently revived by Sir Ray Lankester² in regard to the members of the horse family. Now in the present case it is quite certain that such animals as European cattle, humped cattle, gayal, yak, and the two kinds of bison severally represent perfectly distinct species, in spite of the fact that, under certain conditions, some of them will interbreed and produce fertile offspring when in a state of partial or complete domestication. Consequently, interbreeding or non-interbreeding cannot be taken as a test of the specific or racial status of any kinds of animal.

On the other hand, although such mutually fertile animals as the above are certainly entitled to rank as the representatives of distinct species, it does seem absurd to refer them, as is the practice of many

¹ *Fauna of British India—Mammalia*, London, 1888-91, p. 493.

² "Science from an Easy Chair," *Daily Telegraph*, 21st Jan. 1911.

naturalists, to separate generic groups—the European ox to *Bos*, the gayal and probably humped cattle to *Bibos*, the yak to *Poëphagus*, and the bison to *Bison*. On the other hand, there is more justification for assigning generic rank to the buffaloes (*Bubalus*), which, as we have seen, are not known to breed with any of the other species. In the *Fauna of British India—Mammalia*, Dr. W. T. Blanford included the whole of the members of the cattle in the typical genus *Bos*; and this plan has been followed by myself in *Wild Oxen, Sheep, and Goats*, and it has also been adopted by Mr. R. I. Pocock,¹ as it likewise is in the present volume. That it best represents the relationship of the various species I am fully convinced; although, as stated above, there are certain grounds for generically separating the buffaloes from the rest.

Since writing the above I find that a hybrid between a Chillingham bull and a female yak has recently been bred in the Royal Dublin Zoological Gardens.

¹ *Proc. Zool. Soc. London*, 1910, pp. 933, 934.

CHAPTER XI

SOME EXTINCT CATTLE

GEOLOGICALLY speaking, the ox tribe is an essentially modern group, not dating back, so far as is at present known, before the early part of the Pliocene, or upper, division of the Tertiary epoch. Although the group is evidently related to the antelopes, and, as pointed out in an earlier chapter, may have near affinities with the gnus of Africa, its direct ancestors are still unknown. In this connection it may be mentioned that the earliest representatives of the group are related to the buffaloes, which, as already stated, constitute in some respects the most primitive of the living forms, and are those whose horns come nearest in shape to those of the gnus. That the group is of Old World origin has been already mentioned; the only section which has reached America, by way of Bering Strait, being the bisons, which in past times reached as far south as Texas and California, but never penetrated South America.

Of the extinct aurochs (*Bos taurus primigenius*) of Europe and western Asia a sufficient account has been given in an earlier chapter, although it may be added that the species was represented in Algeria and Tunis by a local race (*B. t. mauritanicus*)

described in 1881 by Mr. P. Thomas.¹ From the European aurochs this race is stated by its describer to differ by its shorter forehead, the more downward and less forward curvature of the bony cores of the horns, and the longer and more slender limbs. A more or less nearly allied species is the great extinct ox (*B. namadicus*) of the superficial, or Pleistocene, gravels of the valley of the Narbada, in central India. Typically the enormous horn-cores are subcylindrical, and directed to a great extent forwards in aurochs-fashion; but in some instances they are compressed at the base, and thus approximate to those of the gaur, thereby suggesting that the fossil species was in some degree intermediate between the aurochs and the gaur and bantin group. The Pleistocene deposits of India have likewise yielded remains of an ox closely allied to, if not identical with, the gaur, although it has been described by Professor Rüttimeyer as a distinct species, under the name of *B. palæogaurus*. And from the corresponding formations of Java Dr. E. Dubois² has recorded a fossil ox, under the name of *B. banting fossilis*, which probably bears much the same relation to the bantin (*B. sondaicus*); remains of the former also occurring in Sumatra.

In northern India, from the well-known Tertiary deposits of the Siwaliks Hills and other low ranges at the foot of the Himalaya, remains of several kinds of cattle are met with, and as these Siwalik strata are certainly not newer than the lower or early portion of the Pliocene period their fossil cattle are the oldest known members of the group. The largest

¹ *Bull. Soc. Zool. France*, Paris, 1881, p. 36.

² *Tejd. Nederland. Ind.*, Amsterdam, vol. li. p. 91.

and most remarkable of these Siwalik forms of typical oxen is one for which I proposed the name *B. acutifrons* in the year 1877.¹ From the aurochs and its relatives this Siwalik ox is distinguished by the sharp longitudinal ridge down the middle of the forehead, the approximation of the sockets of the eyes to the bases of the horn-cores, and the outward direction of the latter, which sweep away from each side of the forehead in a bold arch, and are pear-shaped in section. Unfortunately these horn-cores are very imperfect in the skull from which the species was named, but it may be inferred that when complete they probably measured from 10 to 11 feet from tip to tip. A second and smaller Siwalik skull was described by myself at the same time as representing another species, under the name of *B. planifrons*, in allusion to the flattened form of the forehead.

More or less nearly perfect skulls of a very remarkable type of ox have been obtained from the alluvial Upper Pliocene deposits of the Val d'Arno in Tuscany, and other remains of the same species from the corresponding formations of southern France. This extinct Etruscan ox (*B. elatus*, or *B. etruscus*) represents a distinct subgenus known as *Leptobos*, and is characterised by the absence of horns in the cows, and by those of the bulls arising on each side of the skull from a point nearly midway between the occiput and the socket of the eye, the skull itself being also remarkable for its shortness. In height the Etruscan ox was probably about equal to the bantian. In the bulls the horn-cores curve in a regular sweep outwards, upwards, and finally inwards,

¹ *Rec. Geol. Surv. India*, vol. x. p. 30, 1877; see also *supra*, p. 166, where doubt of the validity of the species is suggested.

while their section is nearly circular. From the bones of the limbs, the Etruscan ox may be inferred to have been of slight and delicate build; while it is further characterised by the presence of an additional thin vertical column on the inner side of the lower molar teeth. By Professor Rütimeyer this and the next species were believed to be more or less nearly related to the bantian: in the absence of horns in the cows these oxen are of a more primitive type than buffaloes, as it seems certain that in all groups of ruminants horns were originally present in the male sex alone.

So far as can be determined from its imperfect remains, the Siwalik representative (*B. falconeri*) of the Etruscan ox differs from the European species by the more slender skull and more upright direction of the horn-cores of the bulls. A third species, *B. fraseri*, has been named on the evidence of a skull from the Pleistocene deposits of the Narbada valley.

In treating of the living European bison in an earlier chapter it was mentioned that this species was represented by an extinct race (*B. bonasus lenensis*) in northern Siberia. This race was described in 1910 by Dr. Max Hilzheimer¹ on the evidence of a skull, still retaining the horn-sheaths, from the frozen soil of the valley of the Wilwi, a tributary of the Lena. This skull is of huge size; and the horns are stated to differ from those of the living bison by being whitish in the basal half, instead of being blackish grey throughout. They are also long and slender, with the sharp points inclining inwards. Another distinction is to be found in the marked convexity of the centre of the forehead, which rises

¹ Sitzber. Ges. naturfor. Freunde, Berlin, 1910, p. 145.

up, when viewed in profile, in a kind of dome-shaped elevation.

The great extinct bison (*B. priscus*) of the caverns and gravels of England and the superficial formations of Europe generally differs from the living species by the enormous size of the horns. The forehead of the skull is relatively broad and flat, and the bony cores of the horns are not inclined backwards at their bases, which are situated nearly in the plane of the front borders of the sockets of the eyes. The long horn-cores generally curve forwards to some extent, although their main direction is outwards; but in some instances they are straighter and inclined more upwards. In England, remains of the species range in time from the gravels of Barrington, near Cambridge, and the brick-earths of Ilford, in Essex, to the forest-bed of Cromer, Norfolk, which is older than either of the other formations. In Europe, its range in space included the British Isles, France, Italy, Germany, and parts of Russia, and it doubtless extended into south-western Asia.

On the walls of the cavern of Font-de-Gaume, in the department of the Dordogne, southern France, the men of the older stone age (palæolithic) depicted what apparently represent two distinct types of bison.¹ One of these corresponds fairly well in contour with the living European bison. The other type is distinguished by the great falling away of the hind-quarters, the enormous development of the hump on the withers, which forms two distinct prominences, the shorter tail, and the longer head. In fact, were it not for the great length of the horns,

¹ See Capitan and Breuil, *Compt. Rendus Acad. Sci. Paris*, vol. cxxxiv. pp. 1536-1539, 1902.

which incline forwards, with an outward direction only at the tips, and project but little above the crown of the head, the sketch might almost serve for a rude portrait of the living American bison.

The two sketches are regarded by Dr. Hilzheimer¹ as severally representing the living and the extinct European bisons. And if these identifications be correct, it is evident that both these animals were living in France during the older stone age. But closely allied species of approximately equal bodily size are not found at the present day living actually in company; and it is accordingly suggested by Dr. Hilzheimer that while *B. bonasus* was, as it is at the present day, an inhabitant of the forests, *B. priscus* was a denizen of the open plains. It should be added, in connection with the above identification, that the extinct European species approximates in certain details connected with the skull and horns to the American bison.

This, however, does not by any means complete the story of the extinct European bison, for Dr. Hilzheimer² has described, under the name of *Bison uriformis*, the hind part of a fossil skull from Klinge, near Kottbus, in northern Germany, which differs in the form of the horns and certain other details from the typical *B. priscus*. It is, however, suggested that it may be only a local race of that species; which, if the specimen be not a hybrid, seems more probable.

For many years the range of the extinct European bison was believed to extend into Siberia, inclusive of the New Siberian Islands, which lie within the

¹ *Mitt. Königl. Naturalienkabinett Stuttgart*, 1909, p. 257.

² *Op. cit.* 1910, p. 141.

Arctic Circle; but Dr. Hilzheimer¹ regards its Siberian representative as a separate species, under the name of *B. primitivus*, its most distinctive feature being the greater extension of the parietal bones on to the frontal aspect of the skull. Here, again, the distinction need not, however, be regarded as of more than racial value; and if this view be accepted, the Siberian bison should be known as *Bos priscus primitivus*.

Before tracing fossil bison into North America, brief reference may be made to the Siwalik *B. sivalensis*, which is the earliest known representative of the group. In the flatness of the frontal region of the skull and the tubular form of the sockets of the eyes this species comes nearer to the living European than to the American species; but the horn-cores are placed lower down on the skull than in either, and there was very probably an extension of the parietal bones on to the frontal aspect of the skull greater than in the Siberian bison. The Siwalik bison may have been the ancestral stock of all other bisons, and perhaps also of the Tibetan yak, which appears to be an offshoot from the bison group.

As mentioned in an earlier chapter, bison made their way into North America by means of a former land-bridge across what is now Bering Strait, probably during the early part of the Pleistocene or later portion of the Pliocene epoch. The fossil American bisons have been described in considerable detail by Professor F. A. Lucas,² who recognises no

¹ *Op. cit.* 1909, p. 254.

² "The Fossil Bison of North America," *Proc. U.S. Nat. Museum*, Washington, vol. xxi. 1899.

less than seven distinct species. Remains of the existing American bison (*B. bison*) occur abundantly in a sub-fossil condition in Big Bone Lick, Kentucky, which formed a regular sepulchre of extinct and other animals. In a completely mineralised condition they have also been obtained from the superficial formations of Kansas—in one case at a depth of 25 feet below the surface—and also from Missouri. Big Bone Lick has likewise yielded skulls of a larger and stouter-horned species described as *B. antiquus*.¹ It is characterised by the comparative stoutness and shortness of the horn-cores, which taper abruptly, and have the basal girth much exceeding the length along the upper curve. In section they are nearly circular or slightly triangular, with the transverse but little longer than the vertical diameter; while at the tips, which are slightly recurved, they scarcely rise above the plane of the forehead. The vertical axis of the horn-cores runs nearly at right angles to the longitudinal axis of the skull;—a character distinguishing the species from all the other American bisons. In this feature *B. antiquus* approximates to a specimen in the British Museum of the European *B. priscus* from the brick-earths of Ilford, Essex,² but the horn-cores of the latter are larger and directed much more upwards. The species also occurs in California, and has the alternative name of *B. californicus*.

A bison from the superficial deposits of Fort Yukon, Alaska, which has received the name of *B. occidentalis*, is readily distinguished from the last

¹ This name is antedated by the Algerian *Bos* (*Bubalus*) *antiquus*, *vide infra*.

² Incorrectly given by Mr. Lucas as *Sussex*.

by the more slender and relatively longer horn-cores, and also by their upward and backward direction. From the characters of the skull it may be described as having horn-cores of moderate dimensions, with the basal girth equal to or slightly exceeding the length along the upper curve, with the section subcircular, and the direction curving regularly upwards and backwards. A nearly complete skeleton of this species was discovered about 1896 in the superficial deposits of Gove County, Kansas.

The third extinct American species, *B. crassicornis*, is typified by remains in the British Museum obtained during the voyage of H.M.S. *Blossom* (1825-28) by Admiral Sir F. W. Beechey from the frozen cliffs of Eschscholtz Bay, Kotzebue Sound, Alaska, which were long referred to the European *B. priscus*. According to Mr. Lucas, the species is characterised by the great relative length of the horn-cores, which largely exceeds the basal girth, the horn-cores being slightly flattened on the upper surface, with the transverse much greater than the vertical diameter, and the direction decidedly backward, while the curve is regular, and the tips are not sharply reflected or directed distinctly backward. Although perfectly distinct from other American species, this bison may very probably have also inhabited north-eastern Siberia.

Allen's bison (*B. alleni*), from the Pleistocene formation of Idaho and Kansas, has long, slender, and much curved horns, slightly flattened above at the bases, with the transverse diameter considerably greater than the vertical, and the length along the upper curve much in excess of the basal girth. From *B. crassicornis* it differs by the much greater

curvature of the horn-cores, which are also more flattened, and thus more elliptical in cross-section: and both species differ from the European *B. priscus* by the more regular tapering and curvature of the horn-cores, and their more backward direction. They are also longer, less conical than in *B. occidentalis*, but shorter and more curved than those of the under-mentioned *B. latifrons*.

The largest member of the whole group is the great broad-headed bison (*B. latifrons*), in which the horn-cores attain a spread of 6 feet from tip to tip, while, as indicated by a leg-bone, the shoulder-height would appear to have fully 6 feet, or from 6 to 9 inches in excess of the largest bulls of the living American species. The horn-cores are of great span, with the length along the upper curve largely exceeding the basal girth, the direction forming a regular but slight curve, the section subcircular, the transverse only slightly exceeding the vertical diameter, and the tips neither abruptly recurved nor directed backwards. Although the general direction of the horn-cores is somewhat backward, they have not the very decided backward trend characterising those of *B. crassicornis*.

Lastly, an imperfect horn-core from Nebraska described as *B. ferox* apparently indicates a bison approximating to *B. latifrons*, but with a less curved and robust type of horn-cores. It should be added that the so-called *B. appalachicolus* appears to have been based on a horn-core of a musk-ox, and *B. scaphoceros* on that of a sheep of the argali group, allied to the Siberian *Ovis ammon*.

As regards the geographical distribution of the fossil bisons of North America, Mr. Lucas remarks

that "*B. crassicornis* has not been found outside of Alaska; *B. antiquus* is not definitely known to occur farther east than Big Bone Lick, Kentucky; and that no species save *B. latifrons* is certainly known from Florida and other southern localities, while it has not been found on the Pacific coast, horn-cores ascribed to this species being really those of *B. antiquus*. *B. occidentalis* is so far known from Kansas and Alaska."

In another passage the same author, after mentioning that it is impossible to correlate detached teeth and limb-bones with the skulls of the different species, remarks that "the best that can be done is to use such material as we have and to endeavour to distinguish the species by their horn-cores, and after going over the subject carefully I am convinced that; in spite of an admitted amount of individual variation, the horn-cores afford very good specific characters. They do not differ among themselves any more than do other portions of the skeleton, and in the present case they are infinitely preferable to scattered teeth. Moreover, the differences between the skulls of such species as *B. bison* and *B. occidentalis* indicate that the various species could be well differentiated did we possess sufficient material. . . .

"So far as can be judged by the appearance of the specimens, or the conditions under which they have been found, all the species might have been coeval, although this is naturally highly improbable."

Turning to buffaloes, it has already been mentioned that the fossil buffalo from the Pleistocene gravels of the Narbada Valley, in central India, for which Dr. Hugh Falconer proposed the name *Bos palæ-*

indicus in 1859, appears racially inseparable from the great straight-horned buffalo of Assam (*B. bubalis macroceros*). If, however, it really represents an extinct race, it should be known as *B. b. palæ-indicus*.

Fossil remains of a buffalo were described in 1823 from the superficial deposits of Dantzic under the name of *Bos pallasii*, while remains from the corresponding formations of Italy were subsequently regarded as belonging to the same type. These remains appear distinguishable from the Narbada buffalo merely by their somewhat inferior dimensions; and I have accordingly suggested that they represent an extinct race of the Indian species.¹ The occurrence of such a buffalo in Germany and Italy during the Pleistocene period casts some suspicion on the belief that the Indian buffalo was introduced into Europe during the Middle Ages.

A huge buffalo, with horn-cores measuring 11 feet or more along the curve, was described in 1851 from the superficial deposits of Algeria under the name of *Bubalus antiquus*—a name antedating the American *Bos* (*Bison*) *antiquus* by one year.

The horn-cores, which appear to be distinctly triangular only in their basal portion, are widely separated on the forehead, are directed at first outwards, backwards, and downwards, and then sweep upwards and finally a little inwards; while the skull is moderately long, with slightly prominent eye-sockets, and relatively short nasals. In 1878 Professor L. Rütimeyer² wrote that in all essential

¹ *Wild Oxen, Sheep, and Goats*, p. 127.

² "Die Rinder der Tertiär-Epoche," *Abh. schweiz. pal. Ges.*, vol. v. p. 146, 1878.

features the type skull of this species approximates to that of the short-horned African buffaloes, and appears to indicate a long-horned gigantic ancestral relative of that group. Three years later Mr. P. Thomas¹ took, however, a somewhat opposite view, remarking that, apart from certain details, the skull of the extinct species is very like that of the modern Indian buffalo; while, on the other hand, the skeleton of the body is much nearer that of the



A PREHISTORIC SKETCH OF THE EXTINCT NORTH AFRICAN
BUFFALO

Cape buffalo. And he adds that if a large arna skull was affixed to the skeleton of a Cape buffalo, we should have an animal closely resembling the fossil *Bos antiquus*.

In my own opinion, Rütimeyer's view is more probably correct; and if so, there may be reason for regarding the modern short-horned buffaloes of Africa as degraded types (see p. 237).

In an article on the Morocco-Algerian frontier, contributed to the *Field* of 15th July 1911, Sir H. H.

¹ *Bull. Soc. Zool. France*, 1881, p. 30 *et seq.*

Johnston reproduces two outline figures of the extinct African buffalo incised on rock-faces near Tiout, south Algeria. The sketches, the age of which is unknown, appear to have been made by a people related to the modern Berbers, but living under conditions similar to those prevalent during the Neolithic or early Metal age in Europe. Sir Harry Johnston states that he was informed by one of the professors at the University of Algiers that other rock-pictures show this buffalo domesticated by a tribe acquainted with the use of metal; a circumstance which renders it all the more remarkable that the species should have become extinct before the time of Carthaginian and Roman history. It may be added that the intermediate characters presented by the extinct Algerian species tend to show that the proposal to separate generically (or subgenerically) the African from the Indian buffalo is unnecessary.

Confirmation of Rütimeyer's view of the affinity of the extinct Algerian buffalo is afforded by a gigantic long-horned skull from the superficial deposits of Cape Colony described by Professor H. G. Seeley¹ under the name of *Bubalus baini*, which appears to be nothing more than a southern race of the northern species. If this be so, the former should be known as *Bos antiquus baini*.

A very remarkable species is the Siwalik buffalo (*B. platyceros*) from the Siwalik deposits of northern India, which is unlike any living member of the group, and characterised by the nearly flat forehead, and the widely separated and strongly triangular horn-cores. These are set very obliquely on the

¹ *Geological Magazine*, London, decade 3, vol. viii. p. 192, 1891.

forehead, situated more in advance of the plane of the occiput than in the living animal, and with their front surface in the plane of the forehead. They taper rapidly and regularly, and are directed upwards and outwards, in symmetrical curve, with an approximate tip-to-tip interval of 29 or 30 inches. Although markedly distinct, this species comes much nearer to the Indian than to the African buffalo.

In addition to *B. platyceros* the Siwalik formations have yielded skulls of at least two smaller buffaloes which were evidently related to the Philippine tamarao and the Celebesian anoa. In Falconer's tamarao (*B. acuticornis*) the skull is of much the same size as that of the Philippine *B. mindorensis*, but the horn-cores are more distinctly triangular in section, with the front outer angle intruding more on to the frontal aspect of the skull, so that the proper front surface of the horn looks to a great extent upwards instead of almost directly forwards. The horn-cores are relatively long and slender, and incline upwards and outwards with the front outer angle, or ridge, forming a subspiral ridge, which rises near the middle line of the base. The second species, known as the Siwalik tamarao (*B. triquetricornis*), has the horn-cores rising from a more pronounced ridge on the vertex of the skull, and sloping more away from the plane of the forehead, so that their proper frontal surface looks more towards the frontal aspect, as in the Philippine tamarao. In the typical skull of this species the horn-cores are distinctly triangular in section, but in one described as *B. occipitalis* the front outer angle is rounded off, so as to produce a pear-shaped section, while the tips curve forwards.

Finally, certain remains from the superficial deposits of Java described in 1891 by Dr. Eugene Dubois¹ under the name of *Anoa santeng* may indicate a member of the present group.

¹ *Nat. Tijd. Nederland. Ind.*, Amsterdam, vol. li. pt. i. p. 96, 1891.

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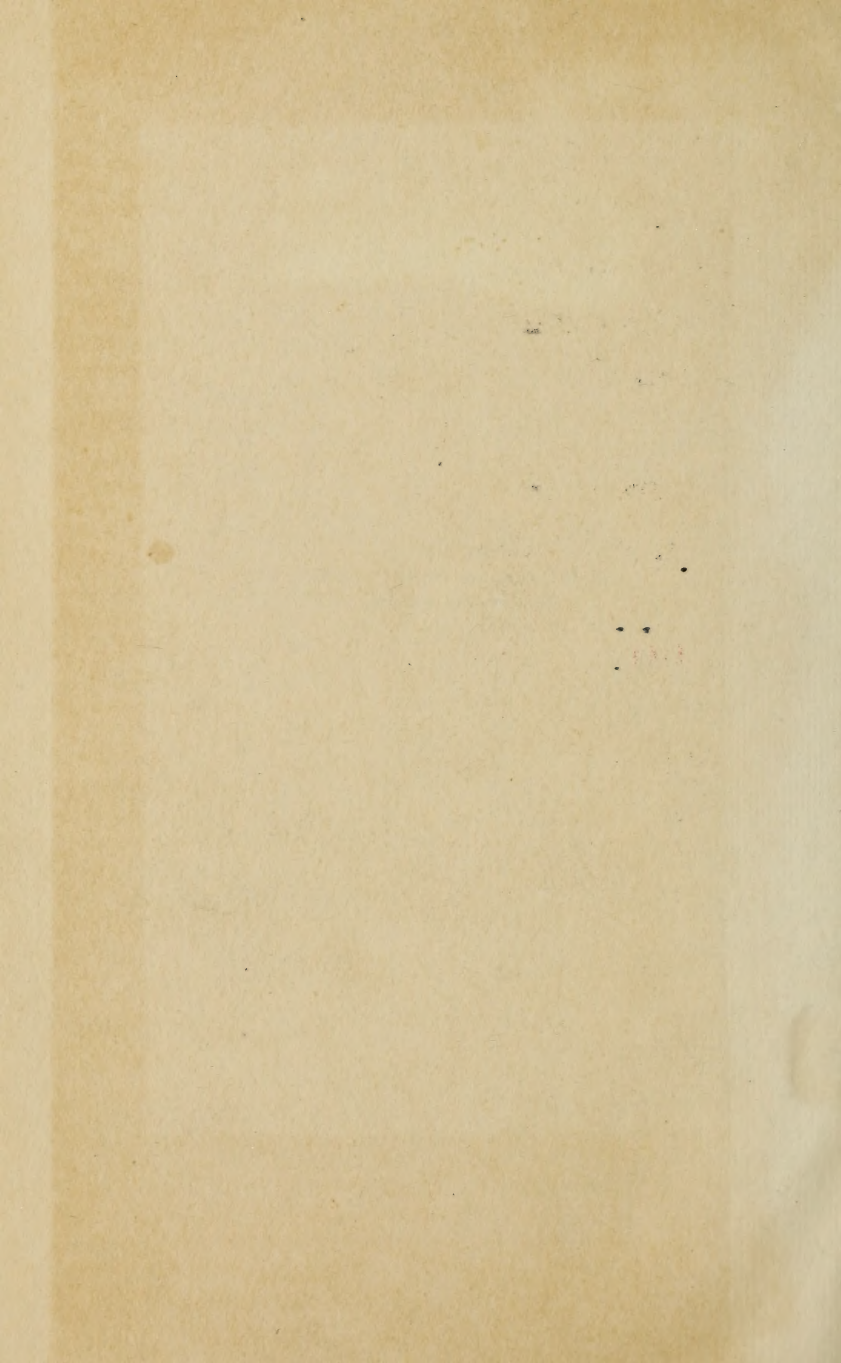
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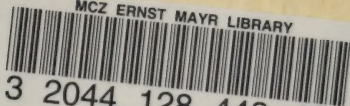
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